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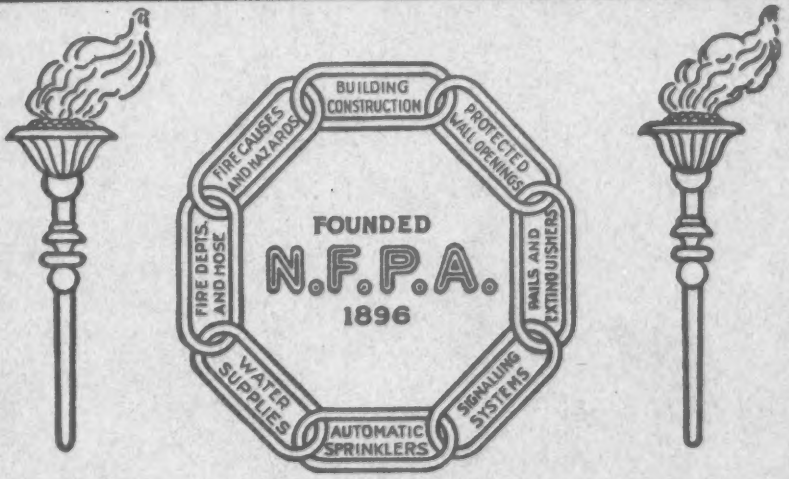
OF THE

NATIONAL FIRE PROTECTION ASSOCIATION



"To Promote the Science and Improve the Methods of Fire Protection and Prevention."

PUBLISHED QUARTERLY AT BOSTON, MASS., BY THE
NATIONAL FIRE PROTECTION ASSOCIATION

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Vol. 30 January, 1937 No. 3

QUARTERLY

OF THE

National Fire Protection Association

Subscriptions are accepted only from members of the Association and are charged as a part of the annual dues. Membership is open to anyone interested.

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Reports of fires appearing in the Quarterly are copies of or extracts from written reports forwarded to the Association. This Association, as a body, is not responsible for the statements or opinions of any of its members.

Earl E. Zahm.

These unsprinklered mercantile buildings in San Diego were undergoing extensive alterations when fire started on the second floor in the early morning hours of Oct. 21, 1936. An automatic alarm summoned the firemen promptly, but a false building front concealed the fire and a blocked stairway delayed access to the burning area. The fire spread rapidly through unprotected openings. All fire fighting had to be done from outside the building, where hose streams could not reach the seat of the fire. The loss was $860,000. **See report on page 239.**

The Quarterly

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Criminal Smokers The idea that a person whose carelessness causes a fire is responsible under criminal law, as well as liable for damages in civil suit, has long been established in European jurisprudence and seems gradually to be gaining ground in America.

A young man enjoying a vacation last September on a ranch near Los Angeles, in an area where smoking was prohibited, thoughtlessly lighted a cigarette. The resulting forest fire burned for days and did enormous damage (see page 236 of this QUARTERLY). The young man went to jail for 120 days.

In a New York rooming house on December 18 an unemployed house painter went to sleep on his bed after lighting a cigarette. Three women, a man and a child were burned to death. The painter escaped — to be held on a charge of manslaughter. The assistant district attorney is quoted as saying, "A man who goes to sleep with a cigarette in his hand and causes damage or death is guilty of culpable and gross criminal negligence."

Cases like these occur too seldom and have too little publicity to have any great educational effect, but if the time ever comes when criminal prosecution or an inquest follows every fire due to carelessness, fewer fires will be caused by the careless smoker.

* * * * *

Use and Occupancy Losses There are many indirect losses as a result of every serious fire in addition to the physical destruction of buildings and contents. Fire protection publicity has for years stressed the importance of indirect losses, including interruption of business, loss of employment, and the complete disruption of the ordinary course of affairs entailed by every major fire. In recent years insurance has been carried to an increasing extent to indemnify business concerns for various indirect losses sustained during the period after a fire until business can be re-established. Such insurance loss payments are for statistical purposes considered as a part of the total fire loss. This practice, however, results in some disproportionate loss figures in individual instances, for such indirect losses are added to the total in cases where use and occupancy insurance is carried, but in other cases where there may be an equal or greater indirect loss but no "U. and O." insurance is in effect, no estimate is made of such losses and this item is not

reported as part of the total loss. This situation is evident in connection with the summary of large loss fires for 1936, published in this QUARTERLY. A number of the fires included are placed in this classification only by reason of a substantial "U. & O." loss. A considerable number of additional fires have doubtless occurred through the year where no such insurance was carried and where the physical property damage was not large enough to put them in the large loss fire classification, but which might have been so included if there were any information as to the loss due to the interruption of business. In the interest of accuracy it would be highly desirable if business interruption loss could be estimated for every major fire, even though no such insurance is carried.

* * * * *

Prevention of Consequential Loss

Although receiving comparatively little publicity, measures for the prevention of indirect loss after a fire are often just as important as the usual measures for fire prevention and fire extinguishment. An unusually interesting case of prompt and intelligent action for the prevention of what might otherwise have been a very large consequential loss has recently been reported by Mr. Alden C. Noble, Chairman, Merchants Fire Assurance Corporation of New York (Member N.F.P.A.). On July 29 an explosion and fire occurred in the power plant of the Empire Storage and Ice Company, Kansas City, Mo. In the explosion two men were killed and the refrigerating machinery was wrecked. The large cold storage warehouse was left without refrigeration.

Temperatures were ranging well above 110° F. in Kansas City, and the problem of what to do to save the 52,000 cases of eggs, valued at $400,000, and approximately $100,000 worth of produce, including grapefruit, celery, potatoes, apples, spinach, etc., faced executives of the storage concern and insurance adjusters. The first plan suggested was to shift the eggs and produce to another cold storage warehouse. However, there were several objections. Owing to the limited elevator facilities, it would require from seven to eight days to get the eggs alone out of the Empire Building by the usual methods. By emergency measures the eggs might have been moved in two or three days, but by that time the temperatures in the refrigerating rooms would have gone up, and the eggs, especially those moved last, would have been in danger of sweating. Another objection was the loss to the Empire of some of its customers.

The eggs were to be transferred in refrigerated trucks. Conrad Mann, president of Empire, asked how the trucks were refrigerated. By dry ice, was the answer. Then, why not, Mr. Mann asked, refrigerate the whole plant with dry ice? Dry ice began to move into the plant at three o'clock that afternoon. Three tons of dry ice were carried into the egg rooms and placed in

the drip pans directly below the refrigeration coils. In addition, some dry ice was placed on two-inch pieces of wood along the floor. All together, 126,831 pounds of dry ice were used. Fans were installed to secure an even distribution of cold air, and tests were made of the carbon dioxide content of the air in various locations so that any excessive concentration might be avoided.

The plant continued to operate as though nothing had occurred; withdrawals went on as usual, and new commodities for storage were received. By working night and day refrigeration equipment was rebuilt, motors rewound, and ice tanks adapted for use as temporary brine tanks, in order to restore the refrigeration service on the ninth day. Due to the successful results obtained by this method, there has been no insurance claim for consequential damage. The expense involved, compared with the value of the produce saved, was very small. The dry ice cost only $3200.

* * * * *

Utility Service Explosions. Modern fire-resistive office or mercantile buildings in cities have many elements of fire safety not found in their predecessors of the previous generation. Building power plants and the large storage of fuel supplies with attendant hazards have been largely eliminated in favor of the facilities offered by electric, gas and other utility services. While the change has certain obvious advantages in reduced fire hazards, current experience shows that serious potential hazards also reside in the newer utility services. They serve the individual building from their vast reservoirs of energy, and give to the individual building the advantage of any desired amount of heat and power delivered on demand. The same facilities, however, through untoward accident, may release a tremendous amount of destructive energy. Two widely separated examples serve to illustrate the potential hazard.

On page 246 of this QUARTERLY appears an account of a gas explosion in Waco, Texas, in which an office building and near-by mercantile buildings were severely damaged. Only the fortunate accident of time, 5:20 A.M., when there was only one man in the building, prevented a holocaust in loss of life. Gas, supplied from a main under a pressure of 60 lbs. per sq in., in some manner leaked into the building and exploded.

In New York on New Year's Day an electric transformer vault under the sidewalk in front of the Metropolitan Life Insurance Co. building exploded soon after 8 A.M., a time when the building and streets were almost deserted. Flames from four transformer vaults shot up to the height of the second story. An effective private fire brigade maintained by the Metropolitan Life Insurance Co. went into action immediately. The New York Fire Department, experienced in handling fires below the street level, attacked the fire expeditiously but with caution, and completed the work of extinguishment soon after

3 P.M. The loss was $25,000, according to newspaper estimates. Due again to the accident of occurrence early on a holiday morning, when few people were about, and due to the knowledge and experience of the fire fighting force, there was no loss of life.

Cases such as these are fortunately infrequent, but the potential hazards of high pressure gas services or large transformers in congested areas are found in varying degrees in most cities. The utility companies themselves are most anxious to avoid such disasters and take all preventive measures that they consider economically practicable. They know that after any such explosion they are likely to have damage suits brought against them, and that in addition to money damage they may suffer in loss of good-will of their customers, the public. Because of this fact, and the highly technical nature of the problems involved, there have been comparatively few attempts by municipal authorities to regulate gas and electric distribution systems, as distinguished from installations in buildings, which are very generally regulated. Explosions such as those in Waco and New York, however, will attract public attention to these hazards, and stimulate municipal authorities to the consideration of regulatory measures, despite the fact that precautions now taken by the utilities have already operated to reduce explosions to a very small number in proportion to the total potential hazard.

* * * * *

Automatic Fire Alarms. Automatic fire alarm protection, where the installation is made in accordance with the regulations developed by the N.F.P.A. Committee on Signaling Systems and Thermostats and are supervised by a central station with facilities for prompt transmission of alarms to the fire department, have in recent years had an excellent record. Reports indicate that in the great majority of cases fires occurring in properties with automatic fire alarm protection are detected in their incipiency and the fire department arrives in time to extinguish them with little or no loss. Automatic fire alarm systems have a real place in the scheme of fire protection, and according to all available information have a fine record in the unsprinklered buildings in which they are commonly installed.

Like any form of fire protection, the automatic alarm has its limitations. Its function is to detect fire in its incipiency and to summon the fire fighting forces. A fire alarm can do no more than this, and if conditions are such that a large loss occurs, even though the fire department arrives promptly, the alarm system should not be blamed. Three examples of such conditions are found in fires reported in this issue of the QUARTERLY. In one case nitrocellulose motion picture film, turpentine and other paint materials spread fire so rapidly that no form of manual extinguishment could have been effective after the first few seconds. In another case, building alteration operations

obstructed access to the point of origin of the fire. The third case was an exposure fire, where the firemen were already at the fire when the automatic alarm came from the exposed building. The fact that automatic fire alarm systems did not prevent serious losses in these cases should not be considered as reflecting upon the value of this form of protection, which almost daily demonstrates its value by summoning the firemen before fires have progressed beyond the incipient stage.

* * * * *

Incendiary Bombs. The world's occasional lull of peace finds trained and inventive minds laying the groundwork for new destruction. When a new formula is developed, the scientists bend their efforts to the discovery of a suitable antidote. Each warring country feels it needs something to spring on its neighbors. The neighbors search out a defense.

With the European hope of peace fading, the nations have gone to work more zealously than ever. Great Britain, for one, has suddenly become aware of the existence of incendiary bombs, a fact since 1918, but conveniently forgotten until recently.

At the Autumn Conference of the National Fire Brigades' Association at Winter Gardens, Malvern, last October, Mr. W. G. Webster advanced the subject of war-time fire protection. He mentioned the danger of incendiary bombs starting a conflagration, and explosive bombs simultaneously destroying water mains. A situation much like that in the San Francisco earthquake of 1906 would ensue. He went on to develop a plan of defense. The regular fire brigades would be supplemented by trained auxiliaries and partly trained volunteers. These would be recruited from retired firemen and private citizens respectively, all of whom had passed the age of 40, supposed limit of the draft. They would be trained periodically in peace time. When an emergency arose, they would be spread in a decentralized pattern through the city. Their communication would be through messengers. Their apparatus would be that particularly suited to the fighting of incendiary bomb fires. Clothed in gas-proof, fire-resistive uniforms, their immediate duty would be to detect and extinguish the fires at their inception.

Chief Officer J. P. Nayler acquainted the meeting with the nature of incendiary bombs in their latest forms. He described their portability, and the unlimited destructive properties of each. At present there are two important types. The first is the magnesium bomb containing a mixture of aluminum and iron oxide called thermite. When this bomb strikes, a concussion fuse ignites the aluminum. Oxygen for combustion is supplied from the iron oxide so that no ordinary means may be employed to extinguish the fire. The magnesium cover is finally ignited and burns with terrifying brilliance. Pouring water on the magnesium only makes it scatter, still burning. Carbon tetra-

chloride, foam, and sodium bicarbonate might as well never be applied. Dry sand or earth is the only effective and readily obtainable means of stopping it. The second is the magnesium bomb containing, in addition to the thermite, a supply of the magnesium alloy known as electron. This bomb is larger, can be better aimed, and scatters its flaming contents over a relatively large area, starting many fires at once. Of newer development are the bombs containing thermalloy, a compound of sulphur that gives off sulphur dioxide. Like those containing phosphorus and carbon disulphide the gas makes these bombs difficult to approach.

Mr. E. A. R. Berkler, Deputy Chief Surgeon of the N.F.B.A., closed the subject with a discussion of the duties of the fire brigade during an aerial attack. The four menaces it must face are: incendiary bombs, explosive bombs, gas bombs, and panic. He particularly developed the fact that householders should never be permitted to call the brigade to deal with incendiary bomb fires. Chaos would surely result. Rather, it was required that the messengers take word to the brigade whenever its help was needed.

The discussion was closed with the motion: "That whilst it has been felt necessary for this conference to discuss matters in connection with aerial warfare, owing to the scientific development of such, it wishes to place on record its earnest hope of continued peace throughout the world."

* * * * *

Asphyxiating Extinguishers. Eight glass bomb extinguishers hung on the ceiling of a waste paper room in a store in Sioux City, Iowa, on October 8. Three of them fell when fire started in the paper. The fumes from the three pints of carbon tetrachloride filled the 2200 cu. ft. room, but did not stop the fire. Two employees on the floor above heard the fire and rushed into the waste paper room carrying soda-acid hand extinguishers. When the firemen arrived they found the employees affected by the fumes and took them outside, where they collapsed. The men received treatment in the hospital and were discharged the next day. The fire department put out the fire with small loss, according to Chief Geo. M. Kellogg.

The gases generated when carbon tetrachloride is applied to fires are familiar to firemen and other users of vaporizing-liquid type extinguishers. While toxic, under ordinary conditions of use the harmful effect of such gases generated during the operation of hand extinguishers seems to be negligible, and the only advice that the N.F.P.A. Committee on Field Practice has thought necessary to give with respect to hand extinguishers of the one or two-quart size is that "care should be taken to ventilate small rooms and confined spaces immediately after using these extinguishers." In the case of the larger sizes, the committee says, "It is necessary to protect operators and others from the possible toxic effect of vapors, especially when using these extinguishers in small rooms or confined spaces."

Because of the possible asphyxiating effect of the vapors, fire protection engineers have generally been reluctant to recommend the automatic application of carbon tetrachloride except to protect enclosed machinery or other spaces which persons do not enter.

* * * * *

The Index. Printed as Part II of this QUARTERLY is a general Index of N.F.P.A. publications from September, 1926, to January, 1937 (not including this QUARTERLY). This 48-page listing of subjects treated in the N.F.P.A. publications during the past ten years furnishes concrete evidence of the extensive ramifications of fire protection and of the comprehensive character of N.F.P.A. literature. The Index does not include the Crosby-Fiske-Forster Handbook of Fire Protection, which itself has a 29-page index, nor other books published by the Association. The periodical literature covered in the present Index has been listed only by main headings considered necessary to identify and locate every important item. Subsidiary items if indexed would increase the list to several times its present size.

The 1936 Fire Loss.

The estimate of the fire loss for the United States for the year 1936 is $293,357,245, according to the preliminary figures of the National Board of Fire Underwriters. The estimated loss for 1936 is more than $34,000,000 above that in 1935 and shows the result of the upward swing of losses begun in the fall of 1935. This increase is believed to be the natural result of increased manufacturing and mercantile activity. The 1936 losses, however, remain approximately $270,000,000 below the peak loss of 1926.

Comparative Monthly Loss Estimates, 1934, 1935, and 1936.

	1934	1935	1936
January	$28,002,583	$23,430,504	$27,729,930
February	31,443,484	25,081,025	30,909,896
March	31,312,359	24,942,703	29,177,406
April	22,028,943	23,267,929	25,786,835
May	25,271,459	21,238,205	21,479,380
June	20,005,692	18,499,095	20,407,485
July	19,484,027	19,293,619	22,357,020
August	19,613,146	18,137,000	21,714,495
September	16,243,870	16,641,882	20,413,537
October	18,236,272	19,785,871	20,439,136
November	20,114,346	20,871,584	20,808,497
December	23,895,879	27,969,288	30,133,628
Total 12 months	$275,652,060	$259,159,945	$293,357,245
Adjusted loss figures (Released later in year.)	$262,848,122	$248,763,856	

Aggregate Loss for Twenty-One Years Exceeds Eight Billion Dollars.

The 1936 fire loss brings the total direct fire waste of the United States during the past twenty-one years up to $8,720,468,692, an annual average of approximately $415,000,000. The following table gives the annual fire losses since 1916.

1916	$258,377,952	1927	$472,933,969
1917	289,535,050	1928	464,607,102
1918	353,878,876	1929	459,445,778
1919	320,540,399	1930	501,980,624
1920	447,886,677	1931	451,643,866
1921	495,406,012	1932	406,885,959
1922	506,541,001	1933	271,453,189
1923	535,372,782	1934	271,197,296
1924	549,062,124	1935	248,763,856
1925	559,418,184	1936 (Est.)	293,357,245
1926	561,980,751		

It may be noted that the final adjustment loss figures for both 1934 and 1935 are less than the preliminary loss figures for those years. It may fairly be assumed, therefore, that the adjusted loss figure for 1936 may also be lower than the preliminary estimate.

Large Loss Fires, 1936.

During the year 1936 there were forty-two fires in the United States and one fire in Canada involving individual losses of $250,000 or more, according to reports received by the N.F.P.A. Executive Office up to Jan. 1, 1937. This compares with thirty such fires in the United States and three in Canada during 1935, and reflects the upward swing in fire losses previously noted. Of the 1936 large loss fires two were conflagrations which destroyed the towns in which they occurred. One of these, the Bandon, Oregon, conflagration of September 26, was caused by a forest fire, and two other large loss fires were due to extensive forest or brush fires. The locations of all the various fires are shown on the accompanying map.

There were two fires which caused losses in excess of $1,000,000, and eight fires causing losses of $500,000 or more. The largest loss of the year was due to the Bandon conflagration, which also took eleven lives (see page 229 of this QUARTERLY). The second largest loss was the fire which destroyed a salmon cannery at Bristol Bay, Alaska, on July 7, with a loss of $1,150,000. This was one of the largest losses ever occurring in a single plant on the Pacific Coast.

The loss figures used for the various fires are based on the most accurate data available when the QUARTERLY went to press. In most instances adjusted figures or authoritative estimates were available, but in a few instances there were available only preliminary estimates, which were verified as far as possible in each case. Regardless of the source of data, all loss figures in the

following list are presented in even thousands, the importance of these fires arising not primarily from the exact amount of the loss, but from the factors responsible for such large loss fires. A summary of each fire is presented in order to show the factors responsible for each large loss as far as information is available.

March 4, Muskegon, Mich., Occidental Hotel. Loss: $250,000.

Fire started in the basement and extended upward through an unused elevator shaft and other unprotected openings. Fire entered fourth floor of new fire-resistive section through unprotected horizontal openings and spread upward through a pipe shaft. (April, 1936, QUARTERLY, page 355.)

March 4, Youngstown, Ohio, Cold Metal Processs Company. Loss: $414,000.

Large metal working plant of skeleton steel frame with wooden sheathed roof contained valuable machinery. Employees fought fire without calling fire department, so that fire was beyond control when firemen arrived. The roof collapsed. (April, 1936, QUARTERLY, page 358.)

March 18, Pittsburgh, Pa., Waverly Oil Works. Loss: $531,000.

Fire occurred during the spring floods. Plant officials did not shut down plant as flood waters approached and water reached fire stills and boilers, causing explosions which set fire to the plant. Flood waters made the plant inaccessible for fire fighting and fire spread to adjoining foundry plants.

March 19, Springfield, Mass., Moore Drop Forge Company. Loss: $500,000.

Flood waters carried oil from underground tanks to the forge furnaces, where it ignited. Sprinklers were put out of commission in fire area by buckling of metal supports, but helped save the main plant building. Flood waters made fire fighting difficult. The greater part of the loss was due to interruption of business.

March 20, Warren, Mass., Ohio Carpet Company. Loss: $343,000.

The sprinkler system was old, with poor spacing of heads, an overloaded dry valve, and a weak water supply. Fire pumps, located at another mill, were inoperative as flood waters had entered the boiler room. Outside fire departments were delayed in responding by flooded roads.

March 21, Peoria, Ill., Congregational Church and Mohammed Temple. Loss: $250,000.

An explosion of unknown origin occurred in the church, which became completely involved by fire almost immediately. The temple, only seventeen feet distant, was taller than the church and quickly ignited.

March 21, Menasha, Wis., High School. Loss: $250,000.

The fire occurred on Saturday when the school was unoccupied. The building was of large value under weak public fire protection.

March 31, Sumter, S. C., Williams Furniture Corp. Loss: $558,000.

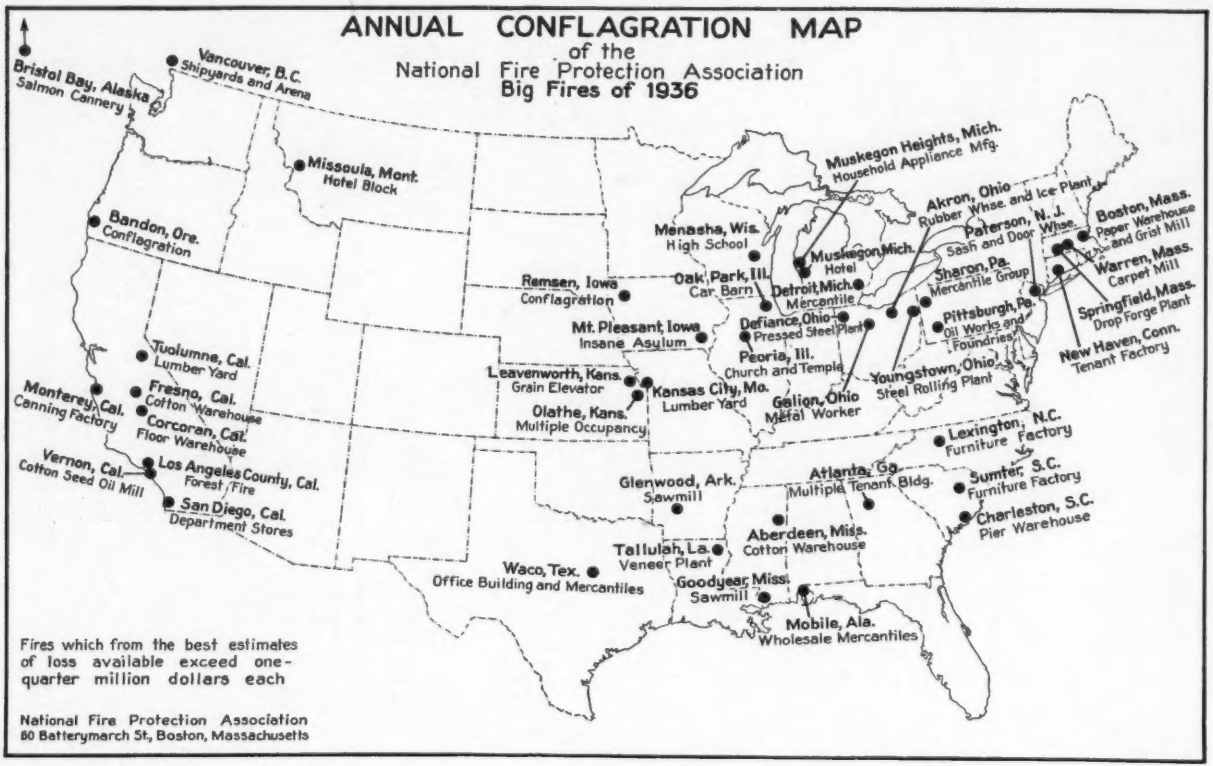
Pyroxylin lacquer was used in finishing furniture, and large amounts of furniture were dried in unsegregated areas without proper ventilating facilities. A flash fire, believed due to ignition of lacquer vapors by an acetylene torch, opened 536 sprinkler heads, overtaxing the water supply. There was no open space between the buildings and the lumber yard.

April 9, Detroit, Mich., Gately's Shops, Inc. Loss: $250,000.

Building was occupied as a retail clothing store. Watchman failed to report fire promptly. When the fire department arrived the fire was coming from the windows and had spread up a large open stairway.

April 21, Sharon, Pa., Protected Home Circle Building. Loss: $280,000.

Combustible interior construction allowed fire to spread beyond control in lodge rooms of the four-story brick-joisted building in which the fire started. Two adjoining brick-joisted business buildings were destroyed due to lack of exposure protection.


ANNUAL CONFLAGRATION MAP
of the
National Fire Protection Association
Big Fires of 1936
Bristol Bay, Alaska
Salmon Cannery
Vancouver, B.C.
Shipyards and Arena
Missoula, Mont.
Hotel Block
Bandon, Ore.
Conflagration
Tuolumne, Cal.
Lumber Yard
Monterey, Cal.
Canning Factory
Fresno, Cal.
Cotton Warehouse
Corcoran, Cal.
Floor Warehouse
Vernon, Cal.
Cotton Seed Oil Mill
Los Angeles County, Cal.
Forest Fire
San Diego, Cal.
Department Stores
Waco, Tex.
Office Building and Mercantiles
Tallulah, La.
Veneer Plant
Glenwood, Ark.
Sawmill
Goodyear, Miss.
Sawmill
Aberdeen, Miss.
Cotton Warehouse
Mobile, Ala.
Wholesale Mercantiles
Atlanta, Ga.
Multiple Tenant Bldg.
Lexington, N.C.
Furniture Factory
Sumter, S.C.
Furniture Factory
Charleston, S.C.
Pier Warehouse
Leavenworth, Kans.
Grain Elevator
Olathe, Kans.
Multiple Occupancy
Kansas City, Mo.
Lumber Yard
Mt. Pleasant, Iowa
Insane Asylum
Remsen, Iowa
Conflagration
Menasha, Wis.
High School
Oak Park, Ill.
Car Barn
Defiance, Ohio
Pressed Steel Plant
Peoria, Ill.
Church and Temple
Galion, Ohio
Metal Worker
Muskegon Heights, Mich.
Household Appliance Mfg.
Muskegon, Mich.
Hotel
Detroit, Mich.
Mercantile
Akron, Ohio
Rubber Whse. and Ice Plant
Paterson, N.J.
Sash and Door Whse.
Sharon, Pa.
Mercantile Group
Pittsburgh, Pa.
Oil Works and Foundries
Youngstown, Ohio
Steel Rolling Plant
Boston, Mass.
Paper Warehouse and Grist Mill
Warren, Mass.
Carpet Mill
Springfield, Mass.
Drop Forge Plant
New Haven, Conn.
Tenant Factory
Fires which from the best estimates of loss available exceed one-quarter million dollars each
National Fire Protection Association
60 Batterymarch St., Boston, Massachusetts

May 1, Lexington, N. C., United Furniture Company, Inc. Loss: $250,000.

The ventilating system had not been in operation and windows were closed to speed drying, allowing furniture finishing room to become filled with lacquer vapors. Fire, possibly due to spontaneous heating of lacquer residue, flashed over the entire room, overtaxing the sprinkler system. Lack of cut-offs and bursting lacquer drums aided the spread of fire.

June 13, Defiance, Ohio, Defiance Pressed Steel Company. Loss: $500,000.

Low water pressure made first private hose streams ineffective, and fumes from burning rubber drove workmen away. Lack of parapets on division walls allowed fire to spread to all parts of plant. Inadequate public water supply and deficient equipment of the volunteer fire department made fire fighting ineffective. (July, 1936, QUARTERLY, page 66.)

June 19, Goodyear, Miss., Goodyear Yellow Pine Company. Loss: $250,000.

The plant was a one-story frame wet log sawing and planing mill 880 feet long. Fire spread rapidly due to the combustible construction and was aided by a minor explosion. Smoke explosions spread the fire and endangered volunteer firemen. Part of the roof of a building two hundred feet away was blown off by one of these explosions.

June 23, Glenwood, Ark. Caddo River Lumber Company. Loss: $500,000.

Rough dressed lumber mills, a planing mill and ten million feet of lumber were destroyed. The large loss was due to lack of adequate protection for large values of combustible materials.

July 3, Mobile, Ala., Marine Specialty Company, Inc. Loss: $250,000.

The fire had spread through the second and third floors of the three-story brick-joisted building when firemen arrived. Burning of paints and oils added to the fire, and fumes from refrigerants in the plant kept firemen back. A falling wall knocked a hole in the wall of an adjoining sprinklered wholesale tobacco concern, but sprinklers checked the fire at that point.

July 4, Remsen, Iowa, Conflagration. Loss: $250,000.

Fire destroyed three brick and eight frame mercantile buildings, a large frame lumber machinery warehouse, two lumber warehouses and yards, three grain elevators, railroad depot, thirteen dwellings, ball park bleachers, planing mill, hatchery, numerous barns and garages, railroad equipment, telephone and electric poles and wires. On the day of the fire the temperature exceeded 110° and there had been several preceding hot dry days. The humidity was low and a strong wind was blowing. Most of the buildings destroyed were of frame construction with wooden shingle roofs. Citizens thought that they had extinguished a fire started by a firecracker, and the fire department was not called until the fire was beyond their control. Many of the volunteer firemen were away for the holiday. Burning of electric wires cut off main water works pumps. Water was wasted through abandoned hydrants.

July 7, Bristol Bay, Alaska, Bristol Bay Packing Company. Loss: $1,150,000.

The plant was a large salmon cannery entirely of frame construction. The fire had considerable headway in the warehouse before it was discovered. Mains and hydrants were practically contiguous to the frame buildings, and within five minutes the fire protection system was wrecked.

July 9, Olathe, Kans., Grange Building. Loss: $300,000.

The building, which was of brick construction equal to three stories in height and covered a ground area of 18,480 square feet, housed mercantiles, a post office, national guard armory, a garage, and a public hall on the second floor. The interior was entirely of combustible construction with a mezzanine deck between the first and second floors. The fire had great headway when discovered and had spread into the top floor when the fire department arrived. The large value of the contents of the armory contributed to the serious loss.

July 28, Leavenworth, Kans., Farmers' National Grain Elevator. Loss: $500,000.

Lightning started a fire in the iron-clad terminal elevator. A wind storm had blown down telephone lines so that the watchman was delayed in reporting the fire. The combustible construction, large size, and value of the contents contributed to the large loss.

August 10, Mt. Pleasant, Iowa, Iowa Hospital for Insane. Loss: $250,000.

Fire had considerable headway when it was first seen coming out of a cupola over the stage section of the auditorium. Private fire protection was weak and fire spread through unprotected openings and through the combustible communicating roof space over the burned sections. The fire was controlled by the public fire departments which responded, preventing a larger loss.

August 20, Vancouver, B. C., Shipyards and Arena. Loss: $250,000.

Two frame shipyards were involved when the fire department arrived. The fire entered the large arena, which was of combustible construction with brick-veneered walls. (January, 1937, QUARTERLY, page 266.)

August 30, Kansas City, Mo., Penrod Jurden and Clark Lumber Co. Loss: $400,000.

The plant was one of the outstanding walnut veneer manufacturing plants in the country, and large values were subject to one fire. A long period of hot dry weather, with temperatures exceeding 100°, preceded the fire. Lumber piles were stacked in a criss-cross method to give ventilation. Public water supplies were inadequate for pumpers. Automatic sprinklers saved the protected portion of one building.

September 7, Los Angeles County, Calif., Cold Creek Forest Fire. Loss: $259,000.

Fire burned 2591 acres of secondary watershed growth and destroyed fourteen buildings. The first fire fighters had to travel fourteen miles, and the fire covered forty acres when they arrived. The section where the fire burned was extremely rough and precipitous. (January, 1937, QUARTERLY, page 236.)

September 14, Charleston, S. C., Clyde-Mallory Line Steamship Terminal. Loss: $470,000.

The pier structures were long one-story frame iron-clad buildings. It is believed that employees fought the fire before sounding an alarm. Half of the property was involved when firemen arrived. The public water supply was insufficient due to small mains, making it necessary for firemen to use small nozzle tips.

September 22, Akron, Ohio, A. Schulman, Inc., and Klages Coal and Ice Co. Loss: $250,000.

Fire spread rapidly through the large area scrap rubber warehouse. Poor hydrant distribution, obsolete fire department apparatus and old hose hampered fire fighting. The fire spread and destroyed the roof of an adjoining ice storage plant.

September 24, Missoula, Montana, Florence Hotel Block. Loss: $400,000.

The four-story brick-joisted hotel building housing several mercantiles was destroyed by a fire starting in the basement of a tenant drug store. Combustible construction and weak public fire protection were the reasons for the large loss.

September 26, Bandon, Oregon, Conflagration. Loss: $1,250,000.

A forest fire entered the town on a wide front and spread by means of highly combustible gorse hedges and wooden shingle roofs. Only two pumpers were available to fight the fire on a mile front, and low water pressure made pumpers necessary. Abandoned hydrants and burned service connections wasted water. The business section was congested and of combustible construction largely built on piles along the river. (January, 1937, QUARTERLY, page 229.)

October 4, 1936, Waco, Texas, Liberty Building, etc. Loss: $280,000.

A gas explosion caused large damage in the office building, and fire spread into an adjoining Woolworth store through a hole blown in the walls, destroying the store. A department store across the street and another store adjoining the Liberty Building were severely damaged by the explosion. (January, 1937, QUARTERLY, page 246.)

October 17, Toulomne, Calif., West Side Lumber Company. Loss: $285,000.

A rapidly spreading forest fire spread to the lumber yard and destroyed more than nine million feet of lumber and 85,000 feet of trams, 2200 feet of pile bottoms, 54 lumber trucks and other property.

October 21, San Diego, Calif., Whitney and Company Department Store and the National Dollar Store. Loss: $860,000.

Heavy stock was on hand in both stores due to anticipation of a longshoreman's strike. Reconstruction operations in the Whitney store made the main stairway to the second floor, where the fire started, inaccessible. Scaffolding and a false wall obscured evidence of the fire. Unprotected openings at the rear of both stores allowed the fire to spread into the National Dollar store. (January, 1937, QUARTERLY, page 239.)

October 26, Muskegon Heights, Mich., Norge Corporation. Loss: $300,000.

Hot air heating ducts of combustible construction were located in air space under the buildings and extended through building walls. Floors over the ducts were of wooden construction. Lack of smoke masks and cellar nozzles handicapped fire fighting operations. There were no sprinklers in the underfloor space where the fire started. A large part of the loss was due to interruption of the production schedule for new models. (January, 1937, QUARTERLY, page 252.)

November 19, Atlanta, Ga., Cable Piano Company. Loss: $250,000.

The fire had great headway when discovered and quickly spread through the five-story brick structure through unprotected elevator and stair shafts. The fire department did not ventilate the building, and attempts to use gas masks were unsuccessful. Overhead wires, parked automobiles, and uncontrolled crowds of spectators impeded fire fighting and rescue operations. (January, 1937, QUARTERLY, page 257.)

November 15, Vernon, Calif., California Cotton Oil Corp. Loss: $350,000.

Fire occurred in frame iron-clad warehouse 380 by 80 feet in area with an all-steel addition 187 by 75 feet in area. Employees first attempted to fight fire with hand equipment, and fire quickly flashed over lint on roof joists and conveyors and over tops of piles of cotton seeds. The building was difficult to get into for fire fighting.

November 22, near Fresno, Calif., Los Angeles Compress Company. Loss: $900,000.

The section of the plant destroyed was of one-story frame iron-clad construction 200 by 400 feet in area. The large loss was due to the concentration of cotton on hand, due to shippers' and warehousemen's strikes. There was a delay of upwards of twenty minutes before the Fresno fire department responded, as it was necessary to get permission from the mayor before the apparatus could leave the city limits. The pressroom of the plant was saved by a fire wall with openings protected by fire doors and automatic sprinklers.

November 25, Monterey, Calif., Del Mar Canning Corp. Loss: $312,000.

Plant was of old frame construction, covering an area of 52,000 square feet, partly constructed on piles over water. The warehouse section was connected to the main plant by two enclosed overhead conveyors without doors. The fire had great headway when discovered by outsiders, and had spread through the conveyors into the warehouse and through an unprotected fire wall opening in the main plant when firemen arrived.

Novmber 27, New Haven, Conn., Associated Realty Company. Loss: $250,000.

Fire occurred in a large group four-story brick mill building occupied for tenant manufacturing and wholesale concerns. Fire originated in the basement and spread upward through No. 9 building and damaged adjoining sections. Sprinklers failed to control the fire, due to corrosion from previous use of salt water in the system. Alcohol in perfume stocks aided the spread of fire.

November 27, Boston, Mass., Boston Globe Warehouse, etc. Loss: $375,000.

Fire had considerable headway when discovered in the two hundred foot long newspaper company warehouse. There was some delay in telephoning the correct location of the fire to the fire department. The fire quickly spread through unprotected window openings to an adjoining grist mill, which was also destroyed. (January, 1937, QUARTERLY, page 268.)

November 29, Aberdeen, Miss., Federal Compress and Warehouse Co. Loss: $445,000.

Fire completely destroyed the south portion of the plant. The large loss was due to a delayed telephone alarm and the destruction of a large amount of valuable cotton.

December 2, Oak Park, Ill., Chicago and West Towns Railway Co. Loss: $250,000.

The section of the one-story brick building occupied as a car barn covered 28,600 sq. ft. and formed one fire area. The fire had considerable headway before an alarm was given, and wind blowing the large open doors spread the fire. Cars in the building were destroyed. Double automatic fire doors and efficient fire fighting were effective in saving the garage section.

December 7, Tullulah, La., Chicago Mill and Lumber Company. Loss: $485,000.

The plant was a one-story frame veneer and plywood factory. The fire started in an underfloor space which was largely unsprinklered. Dense smoke and heavy flooring made the fire inaccessible to fire fighters.

December 10, Paterson, N. J., Hamilton Lumber and Mfg. Company. Loss: $300,000.

The plant occupied a two-story frame building covering an area of 31,000 sq. ft. The fire had considerable headway when discovered. Distant hydrants, the impassable condition of the street beside the plant and the blocking of window openings by stock hindered fire fighting operations.

December 16, Galion, Ohio, Perfection Burial Vault Co. Loss: $275,000.

The plant occupied two groups of brick-joisted buildings separated by a fifteen-foot clear space but with a connecting frame passageway at the second floor level near an elevator shaft. The fire started on the second floor near the elevator shaft and spread through the passageway into the rear section. The second floor of the front building was on fire when firemen arrived. Only three firemen were on duty at the start of the fire.

December 23, Corcoran, Calif., Corcoran Milling Company. Loss: $500,000.

The milling plant was a 400 by 75 foot iron-clad building. Portion not occupied by milling machinery was filled to the roof with wheat, barley, alfalfa, Argentine corn, mixed chicken feed, crushed barley and pancake flour. The loss was increased by the fact that the Pacific Coast maritime strike prevented replacement of special ingredients used in making pancake flour, and by higher grain prices.

Factors Responsible for Large Loss.

As in previous years, an analysis has been made of the forty-three fires to determine the factors that have been responsible for the large losses. Not all the losses can be attributed to one factor, and in some instances as many as four or five factors have contributed. The factor most frequently contributing to large loss fires was "inferior construction." Improved construction, however, cannot be considered a cure-all, as many large losses were due to highly combustible contents or large values of burnable stocks, and other internal hazards, such as flammable liquids and vapors. Another factor contributing to many large losses was the headway of the fire when discovered.

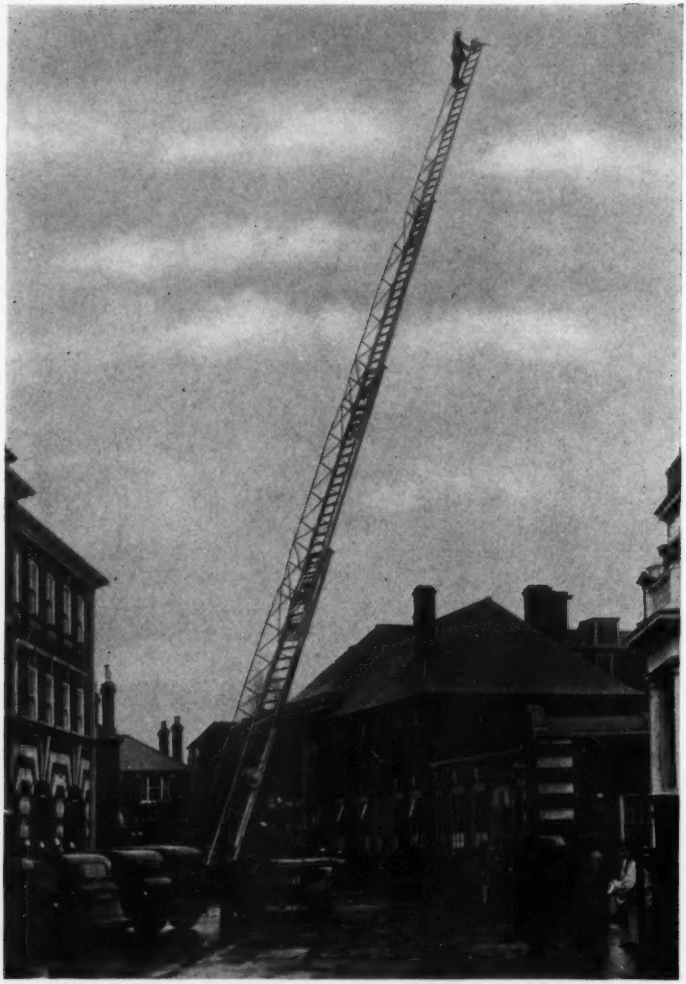
In all of these fires the large losses may be said to be due to the neglect of proven fire protection rules. Where values in excess of a quarter of a million dollars are involved, fire protection is deserving of more consideration than it appears to have been given in most of these cases. Large areas should be subdivided in a standard manner and adequate fire protection should be provided. In many of the fires included in this record, both public and private fire protection facilities were too weak to be effective.

It may be noted that in practically every case these large loss fires might have been prevented, or extinguished in their incipiency, if recognized standard measures of fire prevention and fire protection had been completely observed.

Automatic sprinklers, for example, might have controlled the great majority of these fires with small loss, and lack of standard automatic sprinkler protection might have been cited as the factor responsible in practically every case. The same might be said of various other forms of protection. The table, however, has been prepared in the light of conditions as they existed at the time and place of each fire, to show the factors immediately responsible as stated by the reporting agency.

Reasons for Large Loss.

	No. of Fires	
Structural Factors		43
Inferior construction, excessive areas, etc.	23	
Unprotected vertical openings	8	
Lack of exposure protection	7	
Wooden shingle roofs	2	
Unprotected under floor spaces	2	
Open communicating roof space over buildings	1	
Delays in Giving Alarm		20
Headway of fire when discovered	12	
Effort made to extinguish fire without giving alarm	5	
Storm blew down telephone wires	1	
Telephone alarm did not give exact location	1	
Watchman unable to get telephone operator, possibly due to burning of wires	1	
Occupancy Factors		19
Highly combustible contents, excessive amounts of burnable stocks	13	
Flammable liquids	4	
Inadequate ventilation of flammable vapors causing a flash fire which overtaxed sprinkler protection	2	
Fire Fighting		16
Fire difficult of access for fire fighting	5	
Flood waters hindered fire fighting	3	
Fire department delayed	2	
Poor public fire fighting equipment	2	
Failure of private protection	2	
Building alterations made fire inaccessible	1	
Fumes from refrigerants held back firemen	1	
Fire Protection		15
Lack of fire doors or cut-offs between sections	6	
Lack of adequate public protection	4	
Lack of adequate private protection	3	
Sprinkler system old and defective	1	
Sprinkler heads corroded	1	
Water Supplies		9
Inadequate water supplies or poor hydrant distribution	6	
Low water pressure	2	
Failure of water supplies during fire	1	
Unfavorable weather conditions		5
Forest fire spread on a wide front		3
Explosions		2



All-steel aerial ladder, Borough of Bromley, England, built by Merryweather & Sons, Ltd., London.

This photograph is printed at the suggestion of John H. Osborne (Member N.F.P.A.) to supplement the series of pictures of modern European fire apparatus in the article "Fire Department Practice in Foreign Cities," by Boris Laiming (Member N.F.P.A.) in the last QUARTERLY (Ocotber, 1936, p. 107). The fire department reports available to Mr. Laiming when preparing his article mentioned only aerial ladders of German manufacture, and the article accordingly contained no reference to this modern British apparatus. Mr. Osborne reports that Merryweather aerial ladders of the all-steel type are in use in many cities in England and other countries.

How Canada Views the Sprinkler Tax.

During recent months an attempt has been made to impose an annual "service" charge on sprinkler systems for the purpose of providing additional revenue in three important Canadian cities. The procedure developed in each of these situations and the arguments provided against the charges have proven effective and are reviewed here for the purpose of providing useful information to other communities faced with similar situations.

Winnipeg, Manitoba.

In 1935 the city of Winnipeg reduced water rates generally and thereby lost about $80,000 yearly in revenue. Early in 1936 the city council gave consideration to imposing a special stand-by service charge on the one hundred and fifty odd sprinklered building owners in the city to help make up in part the loss in revenue. A Sprinklered Building Owners' Committee was formed to combat the proposed charge and a brief was prepared for submission to the city council based on data furnished by the National Fire Protection Association, the Canadian Automatic Sprinkler Association, the National Automatic Sprinkler Association and others.

A special committee of the city council gave consideration to the question and on June 13, 1936, subscribed to an opinion by one of its members which follows:

"It appears that the Waterworks Department sells to the Fire Department sufficient water with which to provide fire protection. The cost thereof is charged up to real estate in the tax rate. This water is normally delivered at the scene of the fire through the hydrants. The hydrants, however, are connected up with the ordinary main. The sprinklered buildings have an attachment to the same main. The sprinkler owners pay for the installation of the connecting main to the building and all the sprinkler equipment, so that the city is put to no expense in connection with the sprinkler service. If a fire occurs in the sprinkler serviced building it gets the same water as it would through the hydrants, but gets it through its own connection to the water main. The water which it receives, in case of fire, is water which it has already paid for, as a portion of the real estate tax. The amount of water used is very much less.

"Under these circumstances, I found great difficulty in finding any reason which appealed to me as equitable for imposing an additional charge on sprinkler users. I have looked at the cases referred to by the City Engineer in his report where charges were made. Unquestionably there is ample authority for making a charge if one accepts the practice in other cities as a guide. The

question of expediency, however, is another consideration. The authority indicates that the majority of municipal plants make no charge for sprinkler service and that one-third of the privately owned plants make no charge for sprinkler service. It has been thought wise by a great many corporations to encourage sprinkler installation. Sprinklered buildings not only lessen the expense of fire fighting for themselves, but act as an effective fire barrier in respect of fires on either side. The sprinkler is an aid to the fire department and it is of advantage to neighboring properties. It also has a recognized value in the saving of human life in factories, and in preventing the dislocation of business which leads to unemployment. On the ground of expediency alone, it would seem best in my opinion not to put any charge against the sprinklers, which would interfere with the above benefits to the city and to the citizens by the installation of sprinkler systems. My recommendation would be that no additional charge be made against the sprinkler system.

"I may add that an argument has been made that a greater charge is justified because those who installed the sprinklers get a cheaper rate of insurance. In this respect a quotation from the Terre Haute Paper Company case quoted in the Engineers' report appeals to me — 'The mere fact that this apparatus enabled the owner to protect his property at a lessened cost in no sense justifies the appellee in increasing the price at which it will furnish service, which it has contracted to give.' It would seem more just and equitable that on the contrary a larger sum should be charged against those who do not install sprinkler systems." The report of the committee was adopted by the council as a whole on July 27, 1936.

Hamilton, Ontario.

A water works by-law was adopted by the City Council of Hamilton on March 15, 1935, and was designed to increase water department revenues $9000 annually by inaugurating charges for private fire service. An annual payment of $22,000 from general taxes was already being made by the fire department to the water department for fire protection. The 110 sprinklered property owners organized through the Hamilton Chamber of Commerce and presented a brief to the city authorities, outlining reasons why the charge should be discontinued. After the matter was thoroughly discussed, the by-law was repealed and sprinkler charges were discontinued on January 1, 1936.

Windsor, Ontario.

The Utilities Commission in this city filed a schedule of water rates for 1936, imposing a special charge for private fire service connections which was designed to provide additional revenue of $8,800. The sprinklered building owners in Windsor promptly organized and appointed a committee to present data to the Utilities Commission. The following material is quoted from three memoranda submitted by the committee to the Commission:

We recognize the fact that the Water Division of the Utilities Commission needs revenue to operate as does any other civic department. We are also ready to pay our just share of the amount required provided the taxation levied is fair and equitable as all forms of taxation should be.

The automatic sprinkler has made it possible for manufacturing establishments, mercantile buildings and warehouses, in connection with other safeguards, to expand to enormous proportions and concentrate large values without fear of destruction by fire. Without this equipment this industrial development which has meant so much to the success and welfare of the country and of the City of Windsor would have been impracticable.

In any city or town the greater the encouragement that can be given to sprinkler installations supplied from a good public water system, the more secure will be its business and industries.

In fact, if municipalities would fully appreciate the great reduction in the national fire waste which can be accomplished by more general installation of automatic sprinklers, we believe that in place of imposing any additional charge there would be a tendency to offer the manufacturer or merchant some compensation for the installation of such apparatus. It should be borne in mind that the cost of installing such connections is at the expense of the property owner or tenant, and that in so doing he is actually, in addition to protecting his own property, acting the part of a good citizen in helping to reduce the general fire loss and the amount of civic expenditure necessary for fire protection.

Immunity from large fires in sprinklered plants has helped substantially to maintain a continuous payroll. In view of the comparatively little revenue to be gained through this source, we maintain that the removal of such a possible jeopardy to employment should be of paramount consideration.

Value of Sprinklered Properties.

Protected properties are almost immune from serious fire. No conflagration has ever originated in a well-maintained sprinklered property. On the other hand, fire damage to property not protected by automatic sprinklers is about ten times the amount which may be expected with private protection installed. This large destruction of unsprinklered property constitutes a very substantial proportion of the annual fire loss in Canada. In other words, the owner or occupant who has taken the precaution to install sprinkler apparatus has actually aided the city in reducing its expenses for fire protection. If a fire occurs it is usually extinguished with very small consumption of water; injury or loss of life to the fire department is avoided and a very large expense saved in the use of fire apparatus. There are buildings served by sprinkler apparatus in this city in which over a long period of years water has never been used and in which there has been no loss of any kind. On the other hand, in unsprinklered premises if a fire occurs the building may burn to the ground,

may set fire to other buildings in the neighborhood, and in any event may cause loss in property, business and employment amounting to many times the $8800 revenue.

The contention that a stand-by service to sprinkler systems is rendered through existing water mains is considerably minimized when we consider the fact that there is a great deal less ready-to-serve demand on the water system through the operation of a sprinkler system than with the fire hose. In this particular reference we should like to quote the following extract from a recent letter from the Canadian Underwriters' Association:

> ".....We have just received a 'News Letter' from the National Fire Protection Association in regard to a fire which occurred in a paper warehouse where approximately 2,000,000 gallons of water were used in extinguishing a fire, whereas we believe, had the warehouse been sprinklered the amount of water used would have been only a few thousand gallons, which would have been a great saving in the amount of water required....."

But the sprinklered building pays more taxes, proportionately, than the unsprinklered building. This is one of the primary evidences of the unreasonableness of this tax. It appears to us that in place of imposing an additional charge on buildings serviced by sprinkler apparatus as is done under these new charges, that these owners are actually reducing the fire demand on the water works, thus saving the city a large sum of money, and that they might reasonably ask for a rebate or a lower rate.

Levying of this new tax is not good business from the standpoint of those interested in securing new industries for the city. Revelation of this tax, particularly to a prospective industry, would naturally create an additional difficulty to be overcome in influencing their decision in our favor, because the imposition of this charge would add to their costs and put them in a position of inferiority in competing with similar businesses in other places where such a tax is not imposed, as every factor that enters into cost is scrutinized most minutely.

Enquiries we have made establish the information that no city in Ontario imposes a tax similar to this. In 1935 a service charge upon sprinkler systems was levied in the City of Hamilton. Representations were made to the City Council in behalf of sprinklered building owners and after having been shown the unfairness and discrimination in such taxes, the City Council decided to drop these so-called service charges. It strikes us as hardly desirable to lose the good will of Windsor manufacturers and merchants by such an unreasonable tax.

Tax Contribution of Sprinklered Property Owners.

The owners of sprinklered buildings in the City of Windsor constitute a group representing a large contribution to the taxes assessed in this community. Thirty-four of the thirty-five owners pay business and property taxes annually amounting to $363,000; 11,538 persons are employed in these build-

ings and the owners are now being penalized for protecting these large properties and their employees against interruption in employment through a serious fire. Their contribution to the water taxes alone amounts to $24,000, exclusive of the new charge on automatic sprinklers. The new sprinkler charges would increase the above amount of water taxes by 36 per cent.

These sprinklered building owners have spent approximately $241,000 on sprinkler apparatus, the taxes on which amount to $38,000 for property assessment only, exclusive of business tax which would bring the total well over $50,000. On the above investment in sprinklers, the owners must figure the interest charges amounting to more than the revenue the Water Division expects from this source. We have been advised through personal interview with a local manager that his firm has been contemplating the installation of a sprinkler system with about 1,500 heads at a cost of about $9,000, employing mostly local labor in its installation. In view of this new tax, however, the manager has definitely stated that they will not install this system if these new charges on sprinkler systems are continued.

Fire Department Views on Sprinkler Protection.

At the annual convention of the Dominion Fire Chiefs Association held in Windsor recently, Chief C. J. DeFields of the Windsor Fire Department read a paper on "Sprinkler Systems as a Community Asset." Chief DeFields said in part: "I believe that a sprinkler tax is unfair to the business man who provides such protection and it is certainly not in the interests of fire protection. In my opinion the comparatively small amount derived from such a tax is insignificant when compared to the benefits derived by the public at large in communities protected by automatic sprinklers." He stated further that a sprinkler protected factory or business district in any city will do more to reduce fire loss in that particular city than any number of fire or other inspectors, no matter how efficient they may be. "When the larger manufacturing and mercantile buildings are protected in this way, fire department maintenance costs will be reduced to a minimum," he continued. "The sprinkler watchman is always on the job, he requires neither sleep nor vacation, he does not smoke or drink and if he receives ordinary attention and care will deliver one hundred per cent efficiency."

Dominion Fire Commissioner J. Grove Smith declared: "What Chief DeFields has said has been backed up not only in Canada, but in every industrialized country: Great Britain, the United States, and France particularly. Sprinkler systems were first introduced into Canada, to any extent, in 1920. Since then 2700 sprinkler systems have been installed at a cost of $3,800,000, protecting property valued at $4,000,000,000. The fire loss for sprinkler-protected buildings is just four per cent of the loss for buildings not so protected; that should give us good reason for backing up Chief DeFields."

Sprinklers Conserve Water.

The Utilities Commission has nothing but water to supply for fire fighting. It does not, nor can it have, any water to supply except that in the distribution mains of its system. In a blanket way the community pays the cost of carrying water in the mains "ready to serve" for fighting fire. In turn, all property owners compensate the community in taxes paid and by ratio of taxes paid each property owner acquires a right to use the water in the mains. Additional amounts paid cannot give any added right of increased benefit, for there is no other source from which can come, no possible way in which the water utility can give service to one property that it does not give to all property in the same locality.

"Private fire service" is merely supplementary to "public fire service" and in most cases a full substitute. It does not add anything whatever to the fire-flow demand upon the water utility, for much less water is discharged by automatic sprinklers than through the public fire hydrants in controlling fire.

We would ask your Commission what special "ready to serve" service can be rendered to sprinklered buildings that you do not render to unsprinklered buildings. Your chairman has stated that sprinkler systems are not worth anything unless water is available when needed; we would also add that this is true of hydrants and also true to a large extent of the fire department, and your general manager has stated that your Commission gets water free from the river, and that all the Commission does is to give water service for community consumption and fire purposes. The consumption of water is paid for by the individual user, while the fire service is based on the service rendered to all and paid for by all, and it is impossible for your Commission to give better fire service to one building than to another. Then why single out thirty-six buildings in the entire city for the special "ready to serve" service, when it is absolutely impossible for the Water Division to give one bit of extra service to those thirty-six sprinklered buildings? All that your Commission can do is render a uniform curb service to sprinklered and non-sprinklered buildings alike.

Meters for Sprinkler Services.

The matter of leakage and the unauthorized tapping of sprinkler systems has been brought to our attention by your Commission, and although the reported amount over three years is very small, yet it is one of your problems, although the wastage is of no consequence in comparison to the total general leakage as shown in your report. No doubt you have provided for this small sprinkler leakage in your estimates providing for a 20 per cent loss in unaccounted-for water. To remedy this, in a vague way meters have been suggested and others have suggested periodical inspection. Due to the fact that the meters cost $500 and upwards, we believe this would be asking the sprinklered building owners for an uncalled-for investment, particularly in view

of the very small leakage, and besides, the Water Division would receive practically no net revenue from this source.

We believe it would be unfair to meter the use of water for fires in sprinklered buildings where the quantity consumed is greatly reduced, when non-sprinklered buildings would be without meters and using much larger quantities of water. We are of the opinion that it would be in the interests of your Commission to adopt the policy that we have found in general use in a great many places, that is, to have a periodic inspection for which a justifiable charge would be levied against the buildings which are so inspected.

It has been recognized throughout Canada generally with the exception of two small communities — Port Arthur and Cobourg — that any such charge is unwise and decidedly prejudicial to the interests of the small taxpayer. The information we have from Cobourg is to the effect that a special main was laid, to an area where the water flow was small, at the request of various parties and it was agreed that the users of this main were to pay a small tax per sprinkler head over a number of years until the main was paid for. We have not all the particulars regarding Port Arthur, but we have been given the information that there is no sprinkler head charge in Port Arthur, but there is an annual service charge varying from $7.50 to a maximum of $75.00 and without meters. We are given to understand that there are very few sprinklered buildings in Port Arthur, our information being that there are only two.

Encouragement of Sprinkler Installations.

As stated before, this is not a practice by water boards throughout Canada and we have had from different places information that councils and water boards place themselves on record to the effect that they wish to encourage sprinkler systems in their localities. We might quote the sentiment of people with whom we have corresponded by quoting Mr. E. V. Buchanan, General Manager of the Public Utilities Commission in the City of London, when he states: "The Public Utilities Commission takes the attitude that it is a good thing to encourage sprinkler systems rather than penalize them, and that is why no extra charge is made on sprinklered buildings."

We fully believe that your Commission should take the same attitude toward sprinklered buildings in Windsor. At our first meeting we presented two firms who definitely stated that they would not install sprinkler systems with this extra service charge. We repeat this to bring to your attention that, an extra service charge for no extra service rendered, will discourage sprinkler systems in our city. We believe this is not in the interests of our city as a whole, for many benefits are derived by the public at large by such installations.

Every Hospital Employee a Fire Fighter.

By F. Stanley Howe, A. B., Director,
Orange Memorial Hospital, Orange, N. J.

In the year 1935 some four hundred fires occurred among the seven thousand hospitals scattered over the United States. The peculiar nature of hospital work makes fire one of the most dreaded dangers to which their inmates can be exposed, and requires every possible precaution. Unlike schools, factories or business buildings, whose occupants are presumably well and able to walk to safety, the great problem in hospitals is that of evacuating those physically helpless and in such states of illness as to make the danger of death from fear as much a reality as the risk from burning.

The first consideration in hospital fire safety should include fire-resistive construction of buildings, the protection of horizontal and vertical openings to restrict the spread of fire or smoke, automatic sprinkler protection for hazardous areas or for buildings of combustible construction, extinguishers and standpipe systems, fire alarm equipment, the use of non-combustible furnishings and equipment where practicable, and safe installation of electric wiring and other equipment that may involve a possible fire danger. Even when all these precautions are taken, however, there is a very real possibility of fire. Bed clothing and similar combustible material is always present, and careless smokers are found in hospitals just as in any other kind of building. Even though a fire may not extend beyond a single room it may have most serious consequences in a hospital.

Protection for a hospital and its patients should include preventing fire by every possible means, and organization for its immediate extinguishing upon discovery. As a fire can start at any point, the first line of defense is the employee, whether nurse, maid or orderly, who may be nearest to the point where fire is discovered. Any delay whatever incident to the mobilizing of a specially trained fire-fighting force may create conditions from which helpless patients can be extricated only with the greatest difficulty, if at all, with the added risk of smoke and panic to many who would otherwise be in no real danger.

Some hospitals maintain a special force, trained to cope with a fire once it has gained headway, and some elaborate systems are in use for removing patients from the structures. The main difficulties with these plans are, first, the frightening of patients by the ringing of alarms and the carrying out of drills, and second, the necessary duplication of forces, due to the continuous operation of the hospital, with personnel changing every eight or twelve hours. Furthermore, where patients are to be removed from a burning building in any-

During Fire Prevention Week every year all employees of the Orange Memorial Hospital receive instruction from the chief of the fire department, including a lecture on the causes of fires and their prevention, and a demonstration of the method of sending a fire alarm. The training also includes actual operation of extinguishers by all employees.

thing but the mildest weather, many of them would suffer severely or die of exposure, as suitable provision for immediate housing of them outside the hospital would be very difficult to secure. It therefore seems essential to so train a hospital force that all employees in whatever rank, who might be on duty at any time of the day or night will be competent to cope with any incipient fire occurring under their observation. A knowledge of the rudiments of fire fighting, familiarity with the use of extinguishers, and the confidence born of such knowledge and experience, should enable any employee to handle an incipient fire.

With this as our theory, the Orange Memorial Hospital has, for at least eight years, followed the practice of instructing every new employee in the use of the soda and acid fire extinguisher, and in some cases, particularly the orderlies, in the use of the fire hose. Each year, during Fire Prevention Week, the new class of student nurses and all other employees found to have been engaged since the previous year, are required to report for this instruction and drill.

The training consists first of an explanation and demonstration as to what is inside of the extinguisher and what makes it work. Each individual is given an empty extinguisher on which to practice the motions necessary to putting it into action. It is emphasized that failure of such apparatus to work immediately is an indication of faulty construction or improper charging, and that such an extinguisher should be immediately righted and another one obtained.

These drills are given in an area used for receipt and delivery of goods, adjacent to which is a brick and cement building approximately 15 ft. by 17 ft., which is used for the temporary storage of garbage and waste. This building is supplied with water, electricity and an outlet from the standpipe line to which a two-inch fire hose can be attached. Small fires are started within this building, consisting of a handful of straw, paper or other rubbish, inside a small crate or carton, which is inverted, with the bottom toward the entrance door. The object of this placing is to make it necessary for each individual to go inside and maneuver around into a position where the extinguisher stream can be trained directly on the fire rather than on the outside of the carton. Two such fires are started in the building and allowed to burn until the structure is filled with smoke. Then each candidate is required to lift a full extinguisher from a hook at the regulation waist height, carry it approximately 30 ft. to the door of the building, invert it at the entrance to make sure that it is functioning properly, then enter the building, get in position to play directly on the fire, and extinguish it to the satisfaction of the instructor.

Students are warned against standing directly over a fire, where flame and smoke may interfere with respiration, and are taught how to crouch behind the extinguisher and to keep close to the floor, below the smoke. When the fire it put out the candidate must stop the extinguisher and carry it out of the building. Each individual passing this test receives a certificate signed by the director of the hospital and by the chief of the Orange Fire Department. These certificates read as follows:

ORANGE MEMORIAL HOSPITAL
ORANGE, NEW JERSEY

THIS IS TO CERTIFY THAT

_____

HAS THIS DAY HAD INSTRUCTION AND PRACTICE IN THE USE OF A SODA AND ACID FIRE EXTINGUISHER; AND HAS BY THIS MEANS EXTINGUISHED A FIRE IN A SMOKE-FILLED ROOM.

_____
DIRECTOR OF THE HOSPITAL

_____CHIEF
ORANGE, N. J., FIRE DEPT.

_____
DATE

A part of the training course in the Orange Memorial Hospital, which must be taken by all nurses and other employees, includes drill in removing burning bed clothing. This drill is conducted in a detached fire-resistive building used for waste storage. The conditions closely simulate those in a hospital room, with a dummy patient in the bed.

The local fire department coöperates very gladly, and for several years the head of the Fire Prevention Bureau has been present throughout these tests, thus giving a desirable official touch to the occasion. With the organization which we have developed it is possible to pass 90 individuals through our training mill in less than two hours, and incidentally, this routine assures the discharging and recharging each year of all our extinguishers, with replacement of any parts found to be defective.

For those wishing experience in the use of fire hose, a good sized fire is started in a large crate in the receiving area, and groups of two or three are permitted to put the stream on it, thus gaining an idea of the precautions necessary in the proper use of a hose under full pressure, and preparing them for such an experience should one ever become necessary.

During the years that these tests have been in force, more than 500 individuals have been trained, including not only nurses, but maids, orderlies, kitchen help, waitresses, clerks, technicians, social workers and telephone operators. All seem to appreciate the opportunity and the knowledge gained of fighting a fire under approximately actual conditions.

As an additional feature in the training of our nurses a special demonstration is staged in the small building to illustrate how easily a fire can be handled with presence of mind and a little knowledge. The greatest risk we encounter is of patients breaking rules by smoking in bed when unattended. A hospital bed is placed in the small building with a dummy figure representing a patient. A corner of the blanket is allowed to touch the floor on one side and a cigarette is dropped as it would fall from the hand of a patient dozing off to sleep. To expedite matters a little gasoline is put on the corner of the blanket and set on fire. The whole class of nurses is assembled in the rear of the building, where they can see the entire process. When the fire is going briskly a cry of help is given and a nurse, presumably on floor duty outside, rushes in, sizes up the situation, grabs the blanket from the foot of the bed and draws it from the patient, thus preventing him from burning or asphyxiation. By dropping the burning end on the floor and covering it with the rest of the blanket the fire is immediately extinguished. This point is emphasized to the students as evidence of how easily even a brisk fire can be snuffed out by such simple technique. Another nurse and orderly, called by the first nurse, follow in with a stretcher and remove the "patient" from the bed. We feel that this added demonstration may at some time in the life of any of the nurses be of the greatest value to her, to her patient and to whatever institution may be employing her, should such an incident occur while she was on duty there.

During the last nine years we have had only one incipient fire in the hospital. This was caused by the husband of a patient in one of our buildings dropping out of the window a cigarette butt, which lodged in an awning on a window below. The blaze thus started in the canvas communicated to the screen frame and window sash and would have caused a serious panic in a room containing three women patients but for the prompt, intelligent and thoroughgoing way in which two nurses on duty on the floor met the situation. Both of them had recently been given our course of training in the use of extinguishers, with which they did as complete and perfect a job as any trained fireman could have done under the circumstances.

Based on our experience we have no hesitation in endorsing this method as thoroughly practical and one which can well be followed in any hospital. Unlike the position drills and other formal systems of fire-fighting, which have their place in industrial buildings and places of assembly, this method causes no alarm to the patients, is continuous and comprehensive, and gives both administrator and hospital board the comfort of knowing that every employee, at any time or place, should, and probably will, extinguish the incipient fire with neatness and dispatch.

The Adoption of N.F.P.A. Standards in Law.

By Robert S. Moulton,
Technical Secretary, N.F.P.A.

Cities, towns and states wishing to adopt legislation in the interest of public safety from fire have available in the various N.F.P.A. standards well-considered recommendations suitable to form the basis of legal control of fire hazards and the installation of fire protection equipment. State and municipal authorities are increasingly appreciating the desirability of the use of recognized national standards such as those developed by the N.F.P.A., instead of the independent preparation of local legislation. The N.F.P.A. standards, prepared by national committees of technical experts, are formulated by technical talent which is not ordinarily available to the individual city except at an expense which may be considered prohibitive. The representation of the industries affected and the procedure of adoption of standards by the N.F.P.A. conventions assure the preparation of reasonable requirements which are fair to all concerned and secure the desired safety without imposing unnecessary hardships on any individual interest. These standards are nationally recognized and largely enjoy almost automatic acceptance when made the basis of legal requirements. The local development of standards, as contrasted with the use of national standards, is a wasteful duplication of effort, is inefficient because of the restricted use of the large amount of time and effort involved in the drafting of such requirements, and may give a result which is incomplete or inequitable, owing to the lack of technical talent, the limited experience available in any individual city, and the possibility of undue influence by local commercial interests. Because of these considerations there has been in recent years a growing tendency to utilize recognized national standards such as those prepared by the N.F.P.A. as a basis of legislation. There are, however, some legal difficulties which limit this practice and make it necessary to proceed carefully in order to avoid the adoption of legislation which may be attacked as unconstitutional.

In discussions of the legal principles applying to state and municipal legislation dealing with the application of national standards such as those of the N.F.P.A. it is commonly assumed that whatever may be the powers of a legislative body, those powers are reserved to such legislative body and may not be delegated. This principle may interfere with the adoption of standards by reference, and has so interfered in various instances, depending upon the constitutional and legal provisions applicable. However, the recent tendency has been toward the greater delegation of legislative powers. States may delegate some of their legislative powers to municipalities through enabling acts

or home rule laws, and in both states and municipalities there is in many cases delegation of various details to administrative officers. The extent to which such delegation is legal depends upon the constitutional provisions applying, which vary in different states. There seems to be a considerable variation in legal opinion on such matters, and where the lawyers do not agree the layman should proceed slowly in adopting conclusions as to whether or not any given legislative procedure is constitutional. The final answer can be given only by the decisions of the highest courts. In the case of zoning ordinances, which necessarily involve some delegation of legislative power to an administrative agency, the U. S. Supreme Court has not found that such delegation of power violates constitutional provisions.*

Another principle, applying particularly to municipal ordinances, is that the public must have ample notice of proposed legislation and that every ordinance must have proper publicity.

Constitutional provisions interpreted to limit the delegation of legislative powers, and legal requirements for publication of proposed ordinances, may operate to interfere with the practical use of N.F.P.A. standards as a basis of legislation, although the modern tendency is to avoid such difficulties either through appropriate state enabling acts or through a variety of expedients designed to comply with fundamental legal provisions without violating technical requirements.

The early history of the use of standards of the N.F.P.A. and other organizations as a basis of law included many examples of the complete verbatim incorporation of the standard in law. In the case of a complicated document, such as the National Electrical Code, this is a cumbersome and expensive procedure. If, for example, the 1913 edition of the National Electrical Code was incorporated verbatim in a city ordinance the entire text had to be printed a specified number of times in a newspaper, involving a large expense. The cost of publication of codes in newspapers, particularly in small communities, is a very real obstacle to the adoption of needed fire-safety legislation. This seems wholly unnecessary to comply with the spirit of the law, which is that the public shall have ample notice of proposed ordinances. A document such as the National Electrical Code should be well known to all those who may be affected by the ordinance, and is readily available in printed form to anyone. Furthermore, when the Code is before the city council for adoption in detail there is an opportunity for undesirable amendments of specific provisions at the instance of some selfish local interest. A year or two later, when a new edition of the Code is issued, the ordinance becomes obsolete and the whole process must be repeated or the city must forego the advantage of having an up-to-date ordinance.

*See N.F.P.A. brochure, "City Planning and Zoning," for abstracts of decisions.

State Enabling Acts.

There are several methods by which these difficulties may be avoided and the municipality may enforce a recognized national standard in successive editions as published. One of these is through state enabling laws or home rule acts which permit cities to adopt national standards by reference. This method may require re-enactment or amendment of the original ordinance at intervals to keep the regulations legally up-to-date, for an ordinance which automatically adopts by reference all future editions of a standard may be attacked as an unconstitutional delegation of the legislative power of the city to the N.F.P.A. or other organization concerned. In the case of state laws, as distinguished from city ordinances, there seems to be less restriction of legislative power, as will be discussed in a subsequent paragraph.

When a specific date, edition, or the identifying number of a regulation adopted by reference is specified there is no delegation of legislative authority. This means that every time a standard regulation is revised or brought up-to-date the adopted ordinance must be re-enacted by the city council, provided, of course, the council desires to adopt the revisions. This should offer no obstacle to the adoption of regulations by reference.

State laws in the form of enabling acts which permit cities to adopt certain regulations for themselves are in force in several states. California in 1927 passed an enabling act to permit cities to adopt certain codes by reference as follows:

> "An act relating to the passage of ordinances by cities or counties, and authorizing cities or counties to adopt ordinances relating to building construction, plumbing or electric wiring by reference to published codes on such subjects; provided not less than three printed copies of such code or codes, in book form, have been filed with the clerk.
>
> "The People of the State of California do enact as follows: Section 1. Ordinances passed by cities or counties must be posted or published in a newspaper as required by their respective charters or the general laws; provided that ordinances establishing rules and regulations for such matters as the construction of buildings or the installation of plumbing or electric wiring, where such rules and regulations have been published as a code in book form, may adopt such code or portion thereof by reference thereto without further publication or posting, provided not less than three (3) copies of such code have been filed for use and examination by the public in the office of the clerk of such city or county, as the case may be."

The California enabling act and other state laws patterned after it have been adopted for the primary purpose of permitting the adoption by reference of the Model Building Code of the Pacific Coast Building Officials Conference. The wording of this act is somewhat limited in its scope, and it would appear preferable to have such legislation broad enough to apply to any code or model regulation dealing with fire protection or other matters affecting public safety published by the N.F.P.A. or any other recognized national or state

organization. As a matter of fact the California act is currently interpreted as not being limited to the construction of buildings and the installation of plumbing or electric wiring, nor to material in book form. For example, its provisions are currently interpreted to authorize the following requirement:

> The storage and handling of gasoline, fuel oil and other inflammable liquids shall not be permitted in any Group H Building unless such storage and handling complies with the suggested ordinance Regulating the Use, Handling, Storage and Sale of Flammable Liquids and the Products Thereof, adopted by the National Fire Protection Association, May, 1926. (Uniform Building Code, Pacific Coast Building Officials Conference, Section 1308.)

In 1931 Oregon and Utah passed legislation similar to that of California, and in 1929 New Mexico did the same, except that it was limited to a building code. Idaho has passed an enabling act which applies only to Boise City. Without specific legislation authorizing cities to adopt codes by reference, cities in Alabama, Arizona, Louisiana, Montana, Nevada, New York, North Dakota, Virginia, Washington, Wisconsin, and probably other states have been adopting regulations by reference without publication. Home rule powers in the charters of cities in some states are sufficiently broad to permit the cities to adopt regulations by reference and advertise them for enactment by title without additional state enabling legislation. Enabling acts which specify the method of adopting such ordinances or permit municipalities to determine the adoption method would, however, strengthen the position of these cities and minimize questioning of such action in the courts.

Some city charters permit municipal legislation for the adoption of regulations by reference. The Cin[illegible]ti building code revised in 1933 contains about 400 pages of text, while the standards adopted in this code by reference if printed verbatim would add approximately 1200 additional pages. A total of sixty-six standards, each recommended by one or more of twelve national or state agencies, were thus adopted by reference with enacting advertisement by title. Twenty-three of the sixty-six are fire protection standards recommended by the National Fire Protection Association. The following requirement on automatic sprinklers is typical of such references:

> Every automatic sprinkler system required shall be.....in accordance with the Regulations of the National Board of Fire Underwriters for the Installation of Sprinkler Equipment, as recommended by the National Fire Protection Association, Edition of 1931.....(Cincinnati Building Code, 1933, Section 2801.)

Regulations of the other national organizations such as the American Society for Testing Materials, the American Concrete Institute, the American Institute of Steel Construction, etc., were similarly adopted by reference in the Cincinnati building code.

It is obvious that the effectiveness of legislation, no matter what its form, is very definitely related to the adequacy and competence of the enforcing

agency, and that no fire-safety legislation can achieve the desired objective if the administrative organization or official is incompetent, or if there is inadequate financial support. Civil service requirements and other provisions that affect the efficiency of enforcement are deserving of much greater attention than they have heretofore received; such matters are, however, outside the scope of the present article.

Regulations by Administrative Authorities.

A practical method of securing the desired results without getting into legal difficulties is followed in many cases where basic legislation is enacted, giving in brief form the fundamental principles and delegating to some administrative authority the responsibility for the preparation of detailed regulations to put into effect the intent of the law. In simplest terms, such legislation might say in effect that gasoline and oil must be stored in such a manner as to avoid any undue danger to life and property from fire or explosion, and then delegate to the fire marshal or other administrative official the responsibility for the preparation and promulgation of regulations to carry out the intent of the law or ordinance. The administrative official by this authority is free to use his own judgment and is very likely to take as a basis of his regulations the national standard prepared by an N.F.P.A. committee. By using the successive editions of such standards as adopted, the community can always have the benefit of the latest and the best thought on the matters covered.

Regulations as Prima Facie Evidence.

Another method which has been coming into use in recent years is to specify the fundamental purpose to be secured, requiring that installations shall be made in accordance with standard safe practice and making the appropriate regulations *prima facie* evidence of safe practice. A form such as this is followed to a considerable extent in electrical legislation and has been used to a limited extent in other fields. The following quotation from an N.F.P.A. model ordinance based on an oil burner ordinance in Utica, N. Y., adopted in 1926, is a typical example of this method:

1. All oil burning equipments and storage tanks in connection therewith installed, maintained, or used in the City of....., shall be designed, constructed, installed, maintained and used in accordance with recognized best standard practice* for such equipments, so as not to endanger life or property by fire or explosion.
2. No person, firm or corporation shall install equipment for the burning of fuel oil or the storage of oil in connection therewith without first obtaining a permit from the Bureau of Fire Prevention.

*This might more appropriately read "standard practice," as the regulations do not require *best* practice, but rather the minimum standard considered necessary for reasonable safety.

3. The Bureau of Fire Prevention shall issue permits only for equipment complying with Section No. 1.

The following shall constitute prima facie evidence of such compliance:

The use of oil burning equipments tested and listed by Underwriters' Laboratories.

Installation of oil burning equipments and of oil storage in accordance with the Regulations for the Installation of Oil Burning Equipments and for the Storage and Use of Oil Fuels in connection therewith, as recommended by the National Fire Protection Association.

The Bureau of Fire Prevention may publish such supplementary regulations in accordance with Section No. 1, as may be necessary or convenient for the carrying out of the spirit of this ordinance.

The method of making standards *prima facie* evidence of good practice has been criticized as not making the standard mandatory, but making compliance with it a defense by the installer against any objections that may be raised by an inspector. It is, consequently, eminently satisfactory to the contractor and manufacturer who comply with the national code, but may make it hard for the inspector to deal with contractors who do not comply with the code but claim that their installations are safe. In the case of the Utica oil burner ordinance referred to above, the chief of the fire department reports that entirely satisfactory results have been obtained.

Other Indirect Methods.

Another indirect method of enforcement of standards by reference is through legislation requiring that equipment which may create a hazard, such for example as range oil burners or electric wiring, can be installed only by licensed men, and giving to an appropriate administrative agency control over the requirements for licensing. Such an administrative body may then issue licenses only to men who have passed an examination based on the provisions of the appropriate National Code, and may revoke licenses if it is found that men are making installations in violation of the code. (*E.g.*, Massachusetts General Laws, Chapter 141; Hartford, Conn., range oil burner ordinance effective April 7, 1932.) Similarly, many laws and ordinances require that before work is started plans must be approved by some specified official. This gives the official the opportunity to enforce the appropriate national standard by refusing to approve plans which are not in accordance with the standard.

References in State Laws.

State legislatures generally have broader authority than municipal legislative bodies in respect to the form of legislation, and the delegation of authority to enforcing officials. For example, in Section 6081 of the Consolidated Statutes of North Carolina, dealing with egress requirements for hotels, hospitals and certain other buildings, the following provision appears:

"Where such building is, in the opinion of the Insurance Commissioner, of sufficient size to require more than two ways of egress, the National Fire Protection Association standard governing corridors and stair areas shall be adhered to."

In many states the legislature has delegated to the state fire marshal, or other enforcing agency with similar powers, the responsibility for the promulgation of regulations having the force of law. The following provision of the Michigan Fire Marshal Law, Revision of 1931, is typical of such legislation, but gives to the fire marshal somewhat more unrestricted authority than in some other states:

Sec. 5. The state fire marshal shall make regulations for electrical wiring,* the keeping, storage, use, manufacture, sale, handling, transportation or other disposition of highly inflammable materials and rubbish, gunpowder, dynamite, alcohol, crude petroleum or any of its products, of gas and oil wells, explosive or inflammable fluids or compounds, tablets, torpedoes or any explosive of a like nature, or any other explosives, including fireworks, and firecrackers, the handling and storage of fuel oil and the installation of oil burners, and the handling, storage and use of pyroxylin finishes, and may prescribe the materials and construction of receptacles, and buildings to be used for any of the said purposes. The keeping, storing, using, manufacturing, selling, handling, transporting or disposing of any of the materials enumerated in this section, in violation of the regulations of the state fire marshal, is hereby declared to constitute a nuisance and any person violating such regulations shall be deemed guilty of a misdemeanor and on conviction thereof shall be punished by a fine of not less than fifty dollars and not more than one hundred dollars or by imprisonment in the county jail not more than ninety days, or by both such fine and imprisonment in the discretion of the court.

Under such authority, the fire marshal may adopt as his regulations any N.F.P.A. or other regulations as he sees fit. Such powers have been utilized only to a limited extent in most states, and as the cost of printing is not ordinarily a determining consideration in the case of a document intended for state-wide distribution, the national regulations which have been adopted by state fire marshals have for the most part been printed in their entirety, or in abstract form incorporating the particular provisions considered most important, often with local variations. Under the authority of similar legislation in Kentucky, the state fire marshal has adopted many standards by reference. For example, in the Kentucky Standards of Safety, Edition of 1929, Section I, paragraph 2 (e), the following appears:

The regulations of the National Board of Fire Underwriters [as recommended by the National Fire Protection Association] for the Installation of Blower and Exhaust Systems are hereby adopted and made a part of these standards and apply in all cases. A copy of these regulations is kept on file in the State Fire Marshal's office.

The authority of a state to adopt standards by reference in such a manner that all future editions will be automatically effective apparently varies in

*An amendment in 1935 transferred jurisdiction over electrical matters to an electrical administrative board, as described in the QUARTERLY for April, 1936, p. 315.

different states, depending upon constitutional provisions and court decisions. An act in Kansas which stated that all electric wiring shall be in accordance with the National Electrical Code (without specifying the date of the edition) was declared void by the Kansas Supreme Court some years ago on the grounds of uncertainty and improper delegation of legislative authority (State of Kansas vs. L. M. Crawford et al; A.L.R., Volume 2, page 880, 1919).

In Oregon, on the other hand, national standards have been adopted by reference, without identifying date, in legislation in effect since 1919. The following appears in the Oregon act of 1935 amending Section 61-806 of the Oregon Code of 1930.

> Sec. 61-806. It shall be the duty of the commissioner of the bureau of labor to obtain and keep on file in his office a copy of the latest edition of the National Electrical Code relating to the installation of wires and equipment to convey electrical current, and of electrical apparatus to be operated by such current so far as the same covers fire and personal accident hazards as promulgated and issued by such bureau, and to have printed and to certify to and deliver to all persons licensed under the provisions of this act, and, upon request, to the general public, copies of such code, and for the purposes of this act the latest edition of the National Electrical Code as on file in the office of the commissioner of the bureau of labor on the first day of July of each year, shall constitute the state electrical code for the following fiscal year, and a printed copy of such code, certified to as such by the commissioner of the bureau of labor, shall be received in any court of the state of Oregon as conclusive evidence of the contents of the original on file in the office of the commissioner of the bureau of labor upon the date named in such certified copy.

Legislation Enforced Without Constitutional Test.

Throughout all laws and ordinances dealing with matters of fire prevention and fire protection many references are found to the National Electrical Code, the regulations for the installation of automatic sprinklers, and other N.F.P.A. standards. Even in cases where legal limitations have influenced the adoption of more or less detailed ordinances as contrasted with the adoption of regulations by reference, references to various N.F.P.A. standards appear in subsidiary provisions. For example, an ordinance regulating dry cleaning establishments may include the detailed requirements rather than merely referring to the existing N.F.P.A. regulations on this subject, but in respect to the matter of electrical equipment may contain a reference to the National Electrical Code (Wilmington, Delaware, Fire Prevention Ordinance, Section 116; Tacoma, Washington, Ordinance No. 10923).

Reference to standards for test procedure are frequently found in building and fire prevention codes, where the reference is not itself in the form of a requirement, but rather a definition of the method to be followed in determining compliance with a requirement which has been stated in detail. Typical of such provisions is paragraph 1202.1 of the Detroit building code adopted in

1936, which specifies the number of hours of fire resistance required and states that:

> "All structural elements.....shall be designed to resist a Standard Fire Test conducted in accordance with the Specifications for Fire Tests of Building Constructions and Materials of the American Society of Testing Materials, designated C19-26T....." (This standard, published by the A.S.T.M. as one of several joint sponsors, is also an N.F.P.A. standard.)

There are probably hundreds if not thousands of references in existing state and municipal legislation which have not been tested in the courts, and which are being enforced without question as to constitutionality. It is generally recognized that it is impracticable to cover every minor detail in a municipal ordinance, and that after setting forth the fundamental requirements in sufficient detail to make the intent of the ordinance clear, the treatment of minor or subsidiary matters must be left to the discretion of the enforcing official, or to references to existing national standards. References to national standards are to be preferred to the unrestricted discretion of enforcing authorities, who are often not qualified to rule on technical features. As a practical matter, N.F.P.A. regulations and other national standards are often applied even where no reference to them appears in the law, for officials clothed with wide discretionary authority find that their rulings are less subject to attack when based on established national standards.

In the final analysis the courts are inclined to be guided largely by the reasonableness of legislative provisions and to minimize minor technicalities. If it can be shown that an ordinance is enacted in the interest of public safety and that its requirements are reasonable, courts are generally inclined to lean towards the side of liberality in their consideration of legal technicalities.

Note: The material on which this article is based is on file at the N.F.P.A. Executive Office. It includes files of state and municipal laws and regulations, a monograph, "Adoption of Codes by Reference," by the American Municipal Association, and a paper presented by Frank Burton (Member N.F.P.A.) at the 1930 meeting of the Building Officials Conference of America. Valuable suggestions have been made by M. G. Lloyd (Member N.F.P.A.) and C. M. Stegner (Member N.F.P.A.) which the author gratefully acknowledges.

Oregon Forest Fires.

By Charles E. Randall,
Division of Information and Education, U. S. Forest Service.

The forest fires of late September, 1936, which burned over 100,000 acres of territory in southwestern Oregon and destroyed the towns of Bandon and Prosper, again illustrate the danger to communities and settlements adjacent to wooded areas and show the importance of weather conditions, particularly low humidity, in determining potential forest fire danger. Federal and state forest service agencies did effective work in controlling the many serious fires which covered a two-hundred-mile front. The destruction of Bandon is another instance of the failure of local fire protection facilities to control a forest fire attacking a town on a long front. Water supplies and fire protection forces are usually weakest at the outlying sections of a community. Adequate forest fire fighting equipment should be an essential part of the fire department of any community exposed by wood or brush lands.

Drenching rains fell in northwestern Oregon early in September, and the temperature fell to low levels. It had been a beautiful summer, rainless since early July, but unusually free from forest fires.

Fortified by assurance that came with the heavy rains, federal and state officials relaxed somewhat the fire season restrictions. It seemed a reasonably safe time for farmers and loggers to burn their slashings and dispose of hazardous débris. Closures were lifted on certain forest areas, entry to which had been restricted during the summer. The deer season opened on September 20 and hunters were swarming into the woods. Farmers' land clearing fires and slash burning fires of logging operators were clouding the atmosphere.

Then came two weeks of dry September weather. Fire-weather observers, whose daily job it is to take readings of temperature, humidity and wind velocity, those unerring indicators of forest fire danger, found conditions decidedly worse. Relative humidity below 35 means dangerous fire weather.

On September 26 from Powers, center of the Coos Bay logging district of southwestern Oregon, came the report "temperature 90°, strong easterly winds, relative humidity 7." From Marshfield, the principal seaport in the same district, the weather bureau recorded "temperature 88°, relative humidity 20, smoky." All along the Oregon coast range came similar reports, and on that day smoldering fires spread as if by magic. Fire calls poured into the U. S. Forest Service office at Portland and the State Forester's office at Salem. Fires were out of control along the whole coast range, with the heaviest threat in the Coos Bay area near the towns of Powers, Marshfield, Coquille and Bandon.

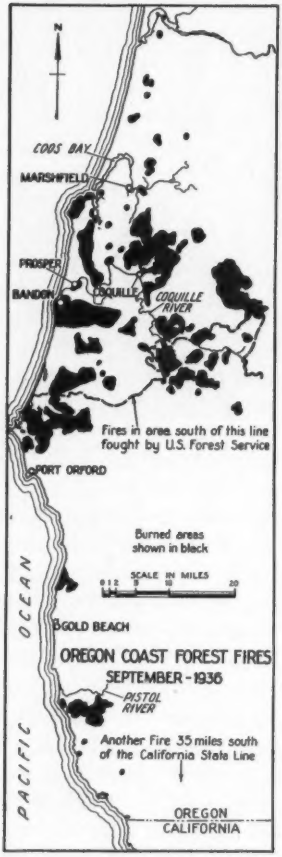
D. C. Burkha.

The forest fire just after it jumped the road east of Bandon at 8 A.M. on the morning following the destruction of the town.

The fire base headquarters of the U. S. Forest Service was immediately established at Gold Beach near the mouth of the Rouge River. Short wave radio and field telephones were installed. Truckloads of C.C.C. men, equipment and supplies began to arrive that afternoon and night at large fires at Pistol River and Euchre Creek along the Siskiyou National Forest border in Curry County.

In the Coos Bay area farther north more serious fires were the problem of state and local protective agencies. Civilians and C.C.C. men were rushed in to protect settlements and towns. During the night the town of Bandon was wiped out. North of Coos Bay, 150 miles of coast mountains territory, including the Siuslaw National Forest, were spotted with fires. By Sunday night heavy fire fighting was going on at many points along a two hundred mile line.

State and federal forestry officials who flew along the coast on Sunday, September 27, could see dozens of fires north and south of Coos Bay and Marshfield. Near Coos Bay they reported an area of some 500,000 acres centering near Coquille like a great semicircle against the Pacific Ocean. Inside of this semicircle little could be seen except the column of smoke which arose to a three-mile elevation. Within this area many large fires were burning, including those which had destroyed the towns of Bandon and Prosper. Into this area came hundreds of fire fighters, including civilians, C.C.C. tree troopers, E.R.A. and Resettlement Administration workers, along with state and federal forest service personnel. Men from thirty-two C.C.C. camps from both Oregon and Washington were brought distances up to six hundred



miles by special trains and trucks. The army efficiently handled the service of supplies.

When the major Curry County fires, first attacked by the U. S. Forest Service, were under control the U. S. Regional Forester made available five hundred additional C.C.C. men to help local authorities protect still threatened towns with fire breaks and other measures. He also took over the work of fighting fire on 160,000 acres of forest area near the national forest boundaries. Nearly a thousand new fire fighters were concentrated in the critical area, and fires were controlled or checked within a few days, although the fires were not completely extinguished for a longer period.

By no stretch of the imagination could the Coos Bay district be considered an unbroken forest area. Hundreds of ranches, dairy farms and clearings lay along stream courses. Interspersed with these ranches and cleared valleys were thousands of acres of logged-over lands and young forests of Douglas fir and Port Orford cedar, for the most part growing on the mountain sides. As the various small fires started by ranchers and loggers got out of control and assumed major proportions, ranchers began setting backfires to save their homes. These fires in some instances caused more damage than the original blazes. The loss in ranch and other improved property has not been estimated.

Although more than 100,000 acres were burned over, comparatively little virgin timber was destroyed. The main forest loss was confined to second growth stands, important to future prosperity and scenic beauty of the district. The U. S. Forest Service forces held losses to 3132 acres burned in the Siskiyou and Siuslaw National Forests and 11,104 acres protected by the Forest Service outside of these boundaries.

The Bandon Conflagration.

On the evening of September 26, 1936, the town of Bandon at the mouth of the Coquille River in Coos County, Oregon, was destroyed by a conflagration when a forest and brush fire swept into the town. Eleven lives were lost and the eighteen hundred inhabitants were made homeless.

The town was a summer resort with lumbering and fishing industries. One sprinklered sawmill, one small planing mill, and a veneer and battery separator plant were the chief industries. The business district located along the river was largely of frame construction and was partly built on piles. The residential district was located on a bluff about fifty feet high back of the business district. Fire limits were of little effect, as frame buildings were permitted inside the limits. A large number of buildings had wooden shingle roofs.

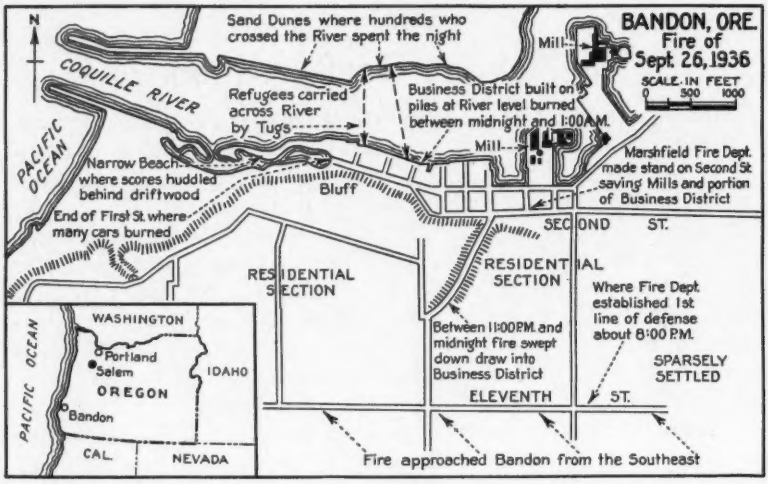
One of the most important factors in the destruction of Bandon was the prevalence of the gorse or Irish hedge in the vicinity. The gorse, an ornamental plant highly thought of in Ireland, where it is also used for forage, was imported to the Oregon coast by George Bennett, one of the founders of Bandon, in 1873 or 1874. The plant is spiny and has numerous branches with very oily leaves. The hedge spread wild around Bandon and more than doubled its size, growing to a height of eight or ten feet, making extremely combustible fuel for the forest and brush fire attacking the town.

A municipally owned water system was supplied by springs, with two reservoirs of 2,066,000 gallons combined capacity located one and a half miles from the town. Two ten-inch redwood supply mains, laid in 1916, brought water to the underground distribution system consisting of 33 per cent eight- and ten-inch, 29 per cent six-inch, and 38 per cent four-inch mains. Hydrant spacing was good, but low water pressure in the residential districts made the use of pumpers necessary. The fire department consisted of a chief and twenty-eight call men, and was equipped with one 500-gallon triple combination pumping engine, a combination chemical and hose truck, and a total of 1700 feet of hose.

Story of the Fire.

During the day of September 26 a brush fire, which had originated in slashings seven miles away, approached the town. The fire had been burning for several days without causing worry to the inhabitants, as farmers and stock men had been given permission to burn their ranges. On this day, however, the temperature had reached eighty-seven degrees and an east wind was blowing at a velocity of between twenty and thirty miles per hour. The relative

Note: Information from which this account was prepared was obtained from reports of the fire by the Oregon Insurance Rating Bureau, by Fire Chief C. F. Otis of Powers, Oregon, and data from other sources.—Ed.



humidity at noon was at the extremely low point of eight per cent.

The fire department during the day had several calls to grass and brush fires, some of which threatened the redwood water supply mains. Alarms came more frequently and by evening the department was out all of the time. The fire traveled rapidly, but up to about 8 P.M. the safety of the town was not considered seriously menaced. Toward the middle of the evening flames appeared at the outskirts of the town, spreading from the forest timber to the gorse or Irish hedge which blanketed the countryside and extended into the town itself. Embers carried by an east wind fell on the nearest wooden shingle roofs and the first house was ignited at 9 P.M. At that time the fire chief went to the local theatre and asked all able-bodied men to fight the fire, and about four hundred men answered the call.

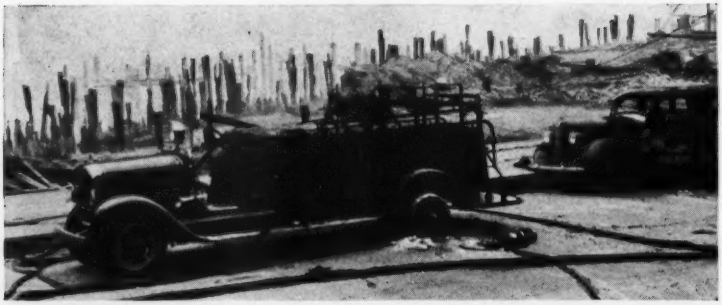
A stand was made at Eleventh Street, running east and west, and also along the highway south. Short lines of hose were laid at important points along Eleventh Street. At times it looked as though the fire would be checked, but strong gusts of wind caused flames to jump one hundred feet or more, while sparks ignited the wooden shingle roofs of houses in the rear of the fire fighters. This caused the abandonment of the stand at 11 P.M. Orders were given for all families to leave their homes and go to the waterfront. At the time the fire crossed the street and started through the town, help was called from Marshfield, Myrtle Point and Coquille. Marshfield sent a 1000-gallon pumper, and the other towns sent hose.

The fire destroyed the residential section in an hour and then spread down into the business district near the river. It was first believed that the

Ruins of homes in the residential section. Fire spread by means of wooden shingle roofs and combustible gorse bushes.

business district would be saved, but within another hour, or by one o'clock, the town was almost completely destroyed. The water supply was adequate for a town of that size, but was a low pressure system and pumpers were necessary for fire fighting. Near-by towns had high pressure water service and did not have fire department pumpers. When they went to Bandon they had to depend upon two pumpers to fight a fire a mile long. Another handicap was the loss of water through abandoned hydrants which could not be shut off due to the intense heat. Also one of the ten-inch redwood mains supplying the town was broken by the burning of a trestle. Hose lines which firemen were using were burned. During the destruction of the mercantile district the

A portion of the ruined business district near the river. The residential section was built on the bluff shown at upper left.



Portland Oregonian.

Bandon fire department pumper which was abandoned by firemen. The rear tire was burned off. Ruins of buildings along the waterfront form the background.

Portland Oregonian.

Ruins of the business district the morning after the fire. A fire truck is being used to pull down dangerous walls.

operator of the Bandon pumper was driven from the machine by the heat. The pump was left running, however, so as not to endanger the men manning the hose. One tire was burned off the apparatus but the pump and motor were not damaged.

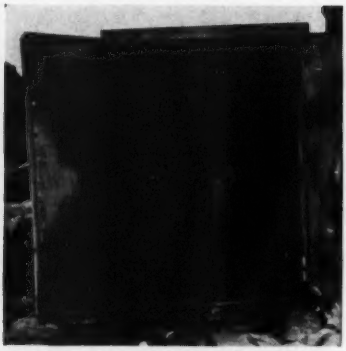
Some property in the business district was saved by three hose lines supplied by a harbor tug. Unfortunately, the shearing of a pin on the tug's pump cut off the supply from these streams. Great credit is given to the Marshfield fire department for saving several business buildings at the east end of Second Street and preventing the spread of the fire to the three industrial plants.

At the left is the 24-inch concrete vault of the Bank of Bandon which was equipped with a time-lock vault door. This vault preserved its contents. The contents of the twenty-inch brick vault of the Bandon City Hall, shown at the right, were destroyed due to failure of the uninsulated steel plate doors.

Loss of Life and Property.

Eleven persons lost their lives. It seems remarkable that more persons did not lose their lives in the rapidly spreading fire. It was not realized that the town would be destroyed until it was almost too late for escape. The forest fire was burning along the highways and had practically isolated the town. The victims of the fire were five men, five women and one child. Most of the adults who lost their lives were aged. Many of the inhabitants were carried across the river by harbor vessels and spent the night on sand dunes. Others were driven out on the beach at the business district, where they were endangered by the burning of fourteen cottages and heat and embers from the main fire. The burning of many automobiles driven to the beach to escape the fire added to the life hazard. Other automobiles burned on the bluff above the beach, where they had been abandoned by their owners. Approximately 150 automobiles were damaged or destroyed, with an insurance loss of $50,000. The loss to buildings and contents was $1,250,000. The insurance loss was approximately $550,000. Mercantile buildings and contents were insured for between twenty-five and thirty per cent of their value.

Remains of the old iron safe from the Golden Hotel. As with most of these safes, the contents were destroyed.



The Winters Jewelry Store trusted in this unapproved safe. The jewelry in the safe was melted.

Record Losses.

The record losses in the conflagration were heavy, owing to the fact that practically all of the safes were of inferior and obsolete types. Of twenty safes and two vaults only four safes and one vault preserved their contents.

The vault in the Bank of Bandon had 24-inch concrete walls and a heavy bank vault door with time lock. While severely exposed, this vault preserved its contents. The vault in the City Hall had 20-inch brick walls, but ¼-inch uninsulated steel plate doors, which are satisfactory only for a half hour fire exposure. This vault was reached about six hours after the fire started. The doors were found badly warped. Carbon tetrachloride extinguishers were then used and the door was sealed with clay, but by this time the town records had already been destroyed.

Most of the safes were old, of the iron type, obsolete in construction, with poor door joints, and altogether inadequate to resist a fire of this severity. It was estimated that the average temperatures were in the neighborhood of 2000° F., and that the fire exposure varied from thirty minutes to twelve hours or more, the temperature being at the maximum during only a part of the longer exposure periods.

The four safes which wholly or partly preserved their contents were exposed to less than the maximum fire severity. One of these was the safe located in Capp's Motor Company garage. The two-story garage building was the only fire-resistive building in the town. When the fire approached, many of the residents brought their belongings to the garage and filled the building to the ceiling. When these goods became ignited the fire was so intense that the building was destroyed. The safe, located near the front, appears to have been away from the greatest heat and preserved its contents. Another safe which preserved its contents was a thirty-four-year-old iron safe in a lawyer's

Safes in the Bandon Conflagration.

Occupancy and Building	Description of Safe	Character of Exposure	Result
City Hall Wood frame, shingle roof.	Iron safe, 1914. Walls 5", door 5½".	1 hr. safe; fell 3 ft.	Contents total loss.
City Hall	Iron safe. Walls 5", door 4½".	3 hr. safe; fell 3 ft.	Contents badly charred but legible.
Capp's Motor Co. Concrete.	Iron safe. Walls 6", door 6½".	6 hr. Draft carried heat away from safe.	Safe warped, but contents in fair condition.
Bandon Cheese & Produce Co. Frame, stucco.	Und. Lab. Class C.	30 min. Fell 10 ft. into river.	Records lost by water damage.
Haga and Church Concrete, wood joisted.	Iron safe. Walls 4", door 4".	No data.	Vital records removed before fire; others badly scorched.
Central Transfer Wood frame, shingle roof.	Iron safe. No data as to wall thickness.	45 min. Fell into river.	Most of records removed before fire; others water soaked but legible.
McNair Hardware Co. Wood frame.	Iron safe. 1926. Walls 4½", door 5".	After fire exposure of unknown time fell 15 ft. into river.	Contents water soaked but legible.
G. P. Topping Concrete, wood joisted.	Iron safe, 1902. Walls 6", door 6".	Fire exposure 12 hrs., but cooled by hose streams. Fell from second floor on to pile of coal.	Contents water soaked but legible.

Note: At least nine other iron safes were involved, on which detailed data are lacking. In practically every case the contents were destroyed.

office. This safe fell twenty-two feet into a ton of burning coal. It had six-inch walls and door, and although subject to severe exposure its contents, although water damaged, were legible. A ten-year-old iron safe, located in a building over the river's edge, fell into the river when the building burned. The safe itself was badly damaged by the fire, but its contents were legible, although water damaged. A fourth safe in which the records were preserved was located in the City Hall. The safe itself was badly damaged, but the records, although badly charred, were legible. The contents of another safe in the City Hall were completely destroyed. In several instances owners, doubtful as to the security of their safes, removed the contents before the fire reached their property.

There was but one safe in this fire bearing an Underwriters' Laboratories label. It was a Class C safe belonging to the Bandon Cheese and Produce Company. This safe was in a building located over the level of the river, and

after thirty minutes fire exposure it fell into the river. When removed from the water two days later the safe was somewhat warped, but the combination was intact. The records were illegible due to water damage. If permanent record ink had been used the records would have been saved.

Cold Creek Forest Fire, Los Angeles County.

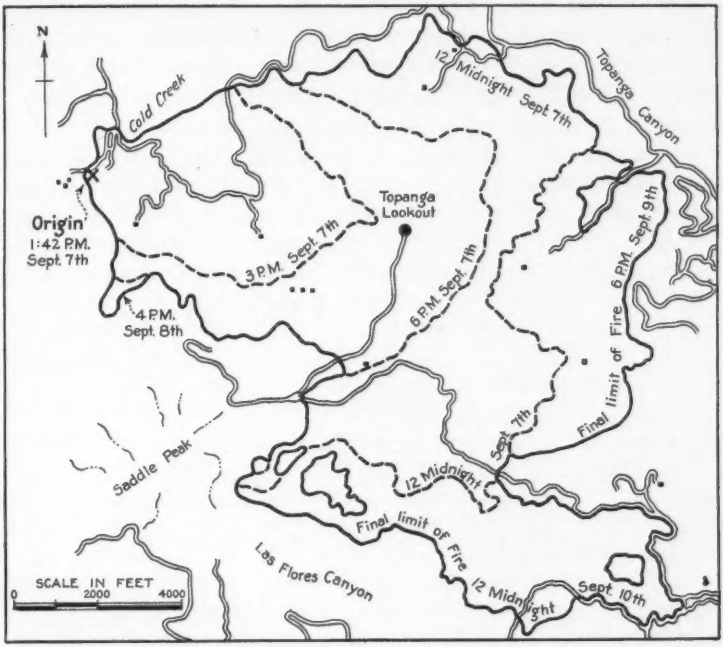
By Spence D. Turner (Member N.F.P.A.).
Los Angeles County Forester and Fire Warden.

On September 7, 1936, a forest fire, which started in the Malibu Mountain district of Los Angeles County, burned over 2591 acres of watershed growth and required eleven days of fire fighting before it was considered under control. This fire, officially designated as the Cold Creek Fire, was caused by a careless smoker, one Elmer Rarity, who was apprehended and subsequently found guilty of the act, receiving a sentence of 120 days in jail.

Weather conditions at the time of the fire were decidedly adverse. The temperature was 102° F. and the relative humidity 12 per cent. The ground cover in this area consisted of very dense stands of canyon oak and chaparral. The topography is precipitous and extremely rough.

First discovery of the fire was made by the Topanga Lookout Tower, approximately one mile distant, at 1:44 P.M., Monday, September 7. This

One sector of the Cold Creek fire, showing the mountainous nature of the territory in which the fire occurred.



The spread of the fire by major time periods, as shown by a Los Angeles County Forestry Department chart.

was verified at 1:46 P.M. by another Lookout, sixteen miles away. The fire spread very rapidly and covered approximately forty acres on the arrival of the first suppression crew, which traveled fourteen miles from division headquarters to the scene in twenty minutes. By 6:00 P.M. the fire had spread rapidly to the south and east, and had covered approximately 1200 acres. By this time crews from C.C.C. camps in the immediate vicinity were actively engaged in the attack, and a fire camp setup was under way.

Until Friday, September 11, the fire continued to make progress, but due to control measures and a break in weather conditions, it was stopped on all fronts on that day. There were, however, many deep gorges and canyons practically inaccessible which necessitated much effort and time to complete a cold trail around the entire burn. Control time was recorded as eleven days and seven hours. Complete elapsed time until the fire was left safe was thirteen days and three hours. There were six hundred men engaged in the control of this fire. These included crews from C.C.C. camps of the Soil Erosion Service, State Park, Federal Forest Service, as well as the County Forestry Department men.

The area covered by the fire was classed as secondary watershed, valued at $100 an acre. With a total of 2591 acres burned over, the watershed damage amounted to $259,100. In addition fourteen buildings in the fire area were destroyed. The perimeter of the fire was fourteen and one-quarter miles.

Conviction of Smoker Who Caused Fire.

Although it is true that it is an exception when a careless smoker receives as heavy a sentence as the young man who started this fire, there are many cases throughout the year in Los Angeles County where persons who smoke in closed areas of high fire risk receive both fines and jail sentences.

The ordinances regulating the use of fire in the unincorporated territory of the County of Los Angeles contain the following provisions:

"It shall be unlawful within said unincorporated territory between the first day of May and the 30th day of November of any year for any person to light, ignite or otherwise set fire to, or to smoke any tobacco, cigarette, pipe or cigar in or upon any mountainous, brush or forest covered land or land covered with any inflammable material, or upon any road or trail traversing any such mountainous, brush or forest covered land or land covered with any flammable material.

"Any person, firm or corporation violating or causing or permitting to be violated any provision of this ordinance, or neglecting, failing or refusing to comply with any term or condition of any permit granted pursuant to the provisions of this ordinance, shall be deemed guilty of a misdemeanor and upon conviction thereof shall be punishable by a fine of not less than Fifty Dollars, nor more than Five Hundred Dollars, or by imprisonment in the county jail for not less than fifty days or more than one hundred eight days, or by both such fine and imprisonment."

The County Forestry Department law enforcement report for the 1935-1936 fiscal year shows 83 arrests and 81 convictions for violation of fire protection ordinances. Arrests were made for the following causes:

Smoking in closed area	40
Burning without permit	20
Throwing lighted tobacco	6
Open fire without permit	6
Leaving fire unattended	4
Violating terms of burning permit	4
Camp fire in closed area	2
Allowing fire to escape	1

For these offenses $2,807.50 in fines were assessed, of which $2,155 were suspended and $652.50 were paid. Jail sentences totaled 597½ days, of which 560 days were suspended and 37½ days served. Some of the justices make it a practice to give an impressive lecture before issuing sentence and qualifying it, depending on the attitude of the culprit. In many cases the lecture has the desired effect and sentence is suspended on good behavior.

The conviction of the man who started the Cold Creek fire was not considered particularly unusual, with the exception of the stiff sentence, which was due to the fact that a disastrous fire was started by his careless act. According to his own story, Elmer D. Rarity of Los Angeles, 23 years of age, was spending his vacation on a ranch in Cold Creek Canyon. On the morning of September 7 he was taking a sun bath lying on a blanket in the dry grass near one of the ranch cabins. He lit a cigarette and threw the match away.

Before he realized what happened, a fire started which he was unable to extinguish, even though he made a strenuous effort. Fearing he would be surrounded by the fire, he made a dash for the road and was apprehended by a rancher, who saw the start of the fire from a distance. When the Assistant Fire Warden in charge of the district arrived, the youth was charged with smoking in a closed area posted with warning signs, and was taken to the nearest Justice of the Peace. Judge Arthur W. Sleeper in Calabasas fined him $250. As Rarity was unable to pay, he was then sentenced to one hundred and twenty days in the county jail.

San Diego Mercantile Fire.

By J. T. Silveira,
Board of Fire Underwriters of the Pacific. (Member N.F.P.A.)

During the early morning hours of October 21, 1936, fire causing damage estimated at $860,000 swept through the Whitney and Company Department Store and National Dollar Store located in the heart of the mercantile district of San Diego, Calif. The fire spread through the middle of the block between Sixth and Fifth Avenues and threatened much valuable property in the vicinity. Adjacent stores suffered smoke and water damage. Factors contributing to the unusually large loss were heavy concentrations of stock in anticipation of Christmas business and because of an impending longshoremen's strike, building alterations in progress which seriously obstructed fire fighting operations, and unprotected openings in the fire wall at the rear of both stores. (See Frontispiece for night photograph of this fire.)

Both buildings were of two and three-story brick and hollow tile joisted construction. The Whitney and Company store extended from Sixth Avenue to Fifth Avenue, a depth of two hundred feet, where it communicated with the National Dollar Store. The second and third floors of the Whitney and Company building and the second floor of the National Dollar Store were crowded with stocks in storage.

A new concrete front wall was being erected on the Whitney and Company store, and the necessary scaffolding and false wall obscured evidence of the fire from the outside and made the fire inaccessible. In addition the front stairway was blocked on account of alterations, and the local sounding device of the automatic fire alarm system had been disconnected.

Story of the Fire.

The fire started during the night on the second floor of the two-story section of the Whitney and Company building from an undetermined cause. The automatic rate-of-rise fire alarm functioned properly, and the alarm transmitted by the automatic fire alarm system central office was received by the fire department at 1:42 A.M. Arriving at the Sixth Avenue side of the

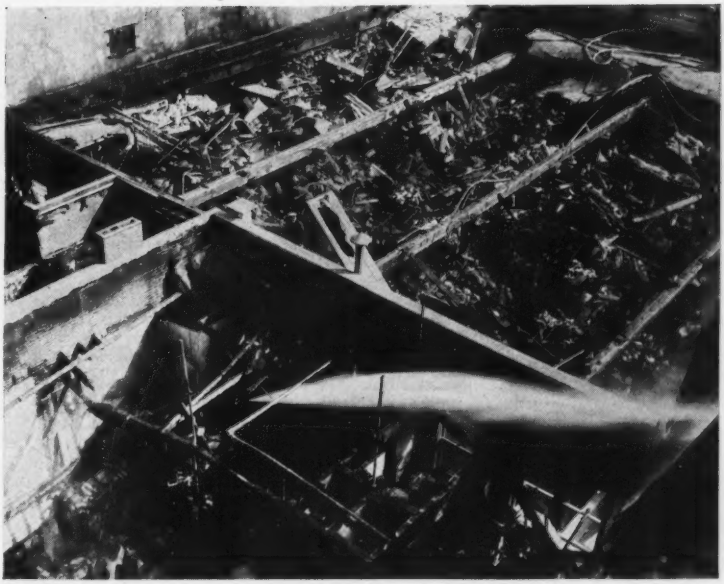
Earl E. Zahm.

Scaffolding for building alterations, a temporary false wall and a blocked front stairway of the Whitney and Company store prevented access to the building and made fire fighting from adjoining roofs and from ladders necessary.

building, the firemen could see no evidence of fire, as the scaffolding and false wall obstructed the windows. The night janitor admitted the firemen. The janitor did not know that there was a fire, as his duties did not take him into the fire area, and the local horn on the automatic alarm system had been removed in connection with the building alterations.

The automatic alarm transmitted to the fire department had indicated that the fire was on the second floor, so the firemen attempted to proceed to this location. The front stairway, furnishing the most convenient access, was blocked by the building operations. The men then proceeded to a rear stairway, but when they reached the second floor level the fire was already too hot to permit entrance to the fire area. As interior fire fighting operations were impossible, the fire was attacked through the roof. However, before long it appeared likely that the roof would soon collapse, so the firemen retreated. Subsequent fire fighting was from adjacent buildings and ladders.

The National Dollar Store ignited by exposure because of unprotected openings in the rear of both buildings. Fire destroyed the second and third floors of both buildings. The deluge of water necessary to extinguish the fire



Earl E. Zahm.

Looking from the rear of the National Dollar Store toward the Whitney and Company department store. Unprotected openings in the walls between the two stores through which the fire spread are shown.

caused excessive water damage to stock on the first floors and basements of both buildings.

In fighting the fire firemen used eleven pumpers to supply twenty-eight streams. Five heavy streams supplied by two or more hose lines, and including a ladder pipe, were used. The water supply was adequate, but the pressure dropped from 85 pounds to 25 pounds per square inch during the maximum draft. The fire department spread twenty-three salvage covers.

Extent of Loss.

The estimated loss of $860,000 does not include the severe loss sustained because of business interruption during the pre-Christmas season. Suitable temporary store locations were not available. The total Whitney and Company loss was $615,000, of which $500,000 was to stock, $65,000 to furniture and fixtures, and $50,000 to the building. There will be considerable salvage to the Whitney and Company building and some salvage to the National Dollar Store building. The total loss to the Dollar Store was $195,000, of which $125,000 was stock damage, $20,000 was furniture and fixtures, and $50,000 was building loss. Adjacent properties suffered $50,000 smoke and water damage.

Fatal Paint Factory Fire, Seattle.

By Washington Surveying and Rating Bureau.
(Member N.F.P.A.)

Two lives were lost and the General Paint Corporation's factory in Seattle was extensively damaged by fire on September 16, 1936, when a carelessly tossed match fell into an open box containing scrap motion picture film. Due to the extremely flammable materials involved, lack of complete sprinkler protection and substandard protection of wall and floor openings, the fire involved most of the building in spite of the prompt transmittal of the alarm and the excellent fire fighting facilities promptly brought into action. The damage to the building amounted to $38,400 and loss of contents was $61,000, making a total of $99,400.

The factory was of good brick semi-mill construction, two stories and basement in height and 100 feet square, divided by a brick division wall running north and south. The east section was divided by another brick wall. An enclosed elevator shaft extended from the basement to the roof and was so located that it communicated to each of the three sections. Openings in division walls and elevator enclosure were numerous and in most cases were protected in a substandard manner. Some openings were entirely unprotected, while a few were protected in a standard manner. There was a stairway at each end of the main division wall. There were no outside fire escapes.

The west half of the building was occupied principally as a warehouse for paint in cans, but contained an office at the south end of the second floor, and the shipping department, where the fire originated, at the north end of the first floor. A large quantity of turpentine in fifty-gallon drums was stored in the basement of this section, but did not become involved.

The northeast section of the plant housed the paint factory on the first and mezzanine floors, and with bulk storage of paint in the basement and dry color storage on the second floor. The wooden floor of the factory was covered with sheet steel. The southeast section, which communicated with the west section through unprotected doorways, was used for supply, and packaged paint storage on the second floor, showroom on the first, and bulk paint storage in the basement.

Fire Protection.

First aid protection consisted of an inadequate number of 2½-gallon foam and soda-acid extinguishers, but no inside standpipes. The basement of the west section was protected by a wet pipe sprinkler system. The east half of the basement was equipped with an open head dry sprinkler system with fire department connections. There were no automatic sprinklers on any part

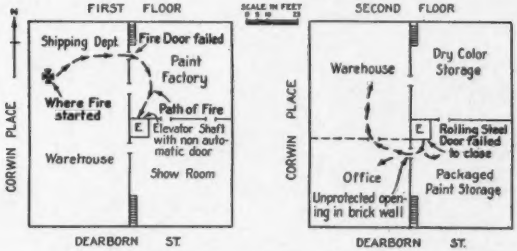


Diagram showing the spread of the fire through improperly protected wall openings.

of the two upper floors, which were the only areas involved in the fire. An automatic alarm system with manual boxes covered the entire building, reporting through a central station. A city fire alarm box was located in front of the building. Adequate hydrants on large water mains were available.

Story of the Fire.

The fire occurred on Wednesday afternoon, September 16, 1936, at 3:56 P.M. The plant had about four hundred pounds of scrap nitrocellulose motion picture film, used in the manufacture of paint remover, stored in the basement. A customer had ordered one hundred pounds of scrap film a few days previously and this was placed in two open wooden boxes. The order was subsequently canceled and the film was returned to the plant a few hours before the fire. As a result of a rush of work the film was allowed to remain temporarily in the shipping room. A regular customer at the plant placed a cigarette in his mouth as he was about to leave the shipping room and a salesman employed by the company lighted it for him, using a paper "safety" match. He fanned the flame out by waving the match and tossed it aside without noticing the surroundings. The match fell into one of the open boxes of scrap motion picture film. Three witnesses testified that the flame of the match was out when it dropped, indicating that there was sufficient heat in the head to ignite the film.

The salesman made a futile attempt to remove the burning film from the box with his hands and then ran for the fire alarm box. The alarm had already been sounded by an employee who had seen the smoke from outside. The automatic alarm operated promptly and was being relayed to the fire department when the public box alarm came in. The shipping clerk went to a near-by plant before the firemen arrived and telephoned to ask that extra equipment be sent.

The fire had tremendous impetus owing to the motion picture film and several drums of turpentine in the shipping room. When firemen arrived the smoke was so dense that the fire had to be fought from the outside. The fire quickly passed through a doorway in the division wall about thirty-five

This dense smoke from burning scrap motion picture film, turpentine and paint stocks in the fire at the General Paint Corporation Plant in Seattle, spread rapidly through openings with non-standard fire doors, and was responsible for the loss of two lives and made fire fighting inside the building impossible.

feet from the point of origin. This doorway was protected by improperly installed double tin-clad sliding fire doors. One of these failed to operate. One roller was found off the track after the fire, but this may have been due to one of the explosions that occurred during the fire. The other door was promptly closed by the superintendent of the factory but had been partly reopened, possibly by an employee attempting to escape or by a fireman later in the fire. It is possible that the fire passed through this door even though closed, as only one binder was provided and the door was not held tightly against the wall, so that gases and flammable liquids could have passed through and ignited materials on the factory floor.

From the factory the fire evidently entered the elvator shaft through a non-automatic door and spread to the second floor of the southeast section through a non-approved rolling steel door that failed to close. This section communicated with the second floor of the west section through an unprotected doorway and thus both floors of the entire building became involved.

The fire department was successful in keeping the fire out of the basement, which contained a large quantity of turpentine. The heat opened sixteen sprinkler heads under the shipping room, but no fire entered the basement. Eighteen hose streams supplied by nine pumpers were in service at the fire, and in addition one thousand pounds of foam powder was used.

The damage was most severe in the factory section, where the greatest quantities of flammable liquids were involved. The second floor and roof of

Firemen were forced to fight the fire from outside of the building due to intense flames, which spread to all portions of the plant through unprotected or poorly protected floor and fire wall openings.

this section collapsed. The shipping room was badly charred and other sections were slightly charred and blackened with smoke.

The loss of two lives was caused by the great volume of smoke which was generated at the start of the fire. A contributing factor was a door from the south stairway to the warehouse and shipping department which was hooked open. A purchasing agent delayed leaving the office on the second floor

to save the company records. He found his escape cut off and called for help from the office windows. He could not be seen at first because of smoke, but finally firemen saw him waving his hand and put up a ladder. Just as they reached him he lost consciousness. The firemen were unable to hold him and he fell, receiving a fractured skull from which he died four hours later. After the fire the body of a clerk was found on the south stairway. It is believed that he returned to the building in an attempt to save the other man. Several office employees who found the south stairway cut off made their way through the factory and escaped by the north stairway.

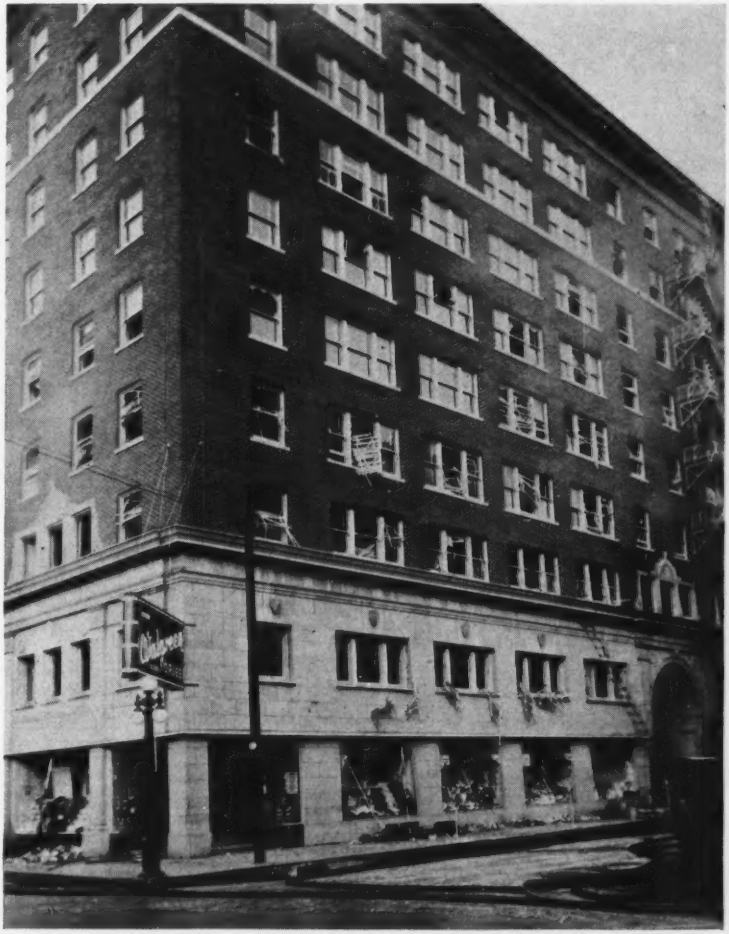
Liberty Building Explosion, Waco, Texas.

By H. Oram Smith,
Texas Inspection Bureau (Member N.F.P.A.)

A terrific gas explosion, followed by fire, occurred in the nine-story fire-resistive Liberty Office Building at the northwest corner of Sixth Street and Austin Avenue in Waco, Texas, at 5:20 A.M., October 4, 1936. Serious damage resulted to this building and adjoining property, and superficial damage was caused to buildings over a wide area. Heavy loss to contents and equipment was incurred by two drug store tenants, office tenants on the lower floors, a Woolworth store adjoining, and the Goldstein-Migel department store across the street, and minor damage to other buildings. Had such an explosion occurred while the buildings were occupied, a large loss of life would have resulted. The janitor, who was the only person in the building at the time, died from his injuries a few hours later. The total loss was approximately $280,000.

Construction and Occupancy.

The Liberty Building is a modern office building of reinforced concrete construction, nine stories and basement, with a small concealed space under a false wooden roof. The stair shaft was unprotected, but the elevator shaft was enclosed. On the west of the Liberty Building on Austin Avenue was a two-story brick-joisted building occupied by a Woolworth store. A portion of the wall of the Liberty Building near elevator, stair and pipe shafts was only a four-inch brick filler wall abutting the twelve-inch independent brick wall of the Woolworth store building. Another two-story brick-joisted mercantile building with a concrete first floor adjoins the Liberty Building on the north on Sixth Street and communicates on the second floor through a one-door opening protected by standard fire doors. Across Sixth Street to the east is the four-story brick-joisted Goldstein-Migel department store building. This store is protected by automatic sprinklers.



The Liberty Building, Waco, Texas, after the gas explosion and ensuing fire of October 4, 1936. Heavy damage occurred on the four lower floors, and several adjoining buildings were extensively damaged. The explosion occurred at 5:20 A.M., when only one man was in the building. Its force was so great that a heavy loss of life would have been probable if the explosion had occurred during office hours. This picture was taken at the corner of Sixth Street (right) and Austin Avenue (left), looking northwest.

Story of Fire.

Following the explosion a fire alarm was received at 5:25 A.M. When firemen arrived flames were issuing from the boiler stack above the top of the building, from the top of the elevator shaft and from the east and west sides

Main entrance of the Liberty Building on Sixth Street. The drug store at the right of the entrance, located over the boiler room where the explosion occurred, was a total loss. Fire doors kept most of the fire out of the two-story mercantile building at the extreme right, but windows and skylight were blown out by the explosion. The rear wall of the building (see next picture) was blown out near this point.

of the building on the first floor. During the progress of the fire two small explosions occurred, one in the basement and one in the adjoining Woolworth store. The fire was fought with thirteen streams, including a ladder pipe, which were supplied by seven pumpers. Water was first turned on the fire at 5:30 A.M., and all streams were operated continuously until about 10:45 A.M., when lines began to be slowly withdrawn.

In the Liberty Building severe damage occurred on all floors up to and including the fourth. Numerous partitions and practically all windows were blown out and much office equipment was damaged. Lesser damage occurred on upper floors from broken windows and bulging partitions. The portion of the west wall which was constructed of four-inch brick and the abutting twelve-inch brick wall of the Woolworth store were blown out over a distance of two bays and up to the top of the second floor. Fire apparently gained entrance to the Woolworth store through this opening and caused practically a total loss to both building and contents.

The only damage to the structural frame of the Liberty Building appeared to be the cracking and bulging upward of the reinforced concrete floor over the boiler room and the sagging and cracking of one of the supporting rein-

The Goldstein-Migel department store, located across Sixth Street from the Liberty Building. This sprinklered property suffered a $28,000 loss when windows were blown inward, damaging the stock. There was no fire in this building.

forced concrete beams. The loss to the building was probably under forty per cent. The contents of a drug store on the first floor immediately over the boiler room suffered a total loss. Another drug store on the first floor and basement suffered a partial loss. Losses to office tenants varied.

Fire doors operated and kept practically all fire out of the two-story mercantile building north of the Liberty Building. Slight fire damage occurred in the southeast corner, where fire apparently gained entrance through cracks in the wall. However, windows and the skylight in this building were blown out and some contents were damaged. The rear wall which adjoined the rear of the Woolworth store was seriously damaged and bulged inward on the first floor.

The Goldstein-Migel store building across Sixth Street had every window in the west and south sides blown inward over the entire building, resulting in considerable damage to stock. There was no fire in this building. Some glass show cases were also broken. Numerous windows were broken in other buildings within a radius of two blocks and some up to a distance of five blocks.

Cause of the Explosion.

It is difficult to determine the exact cause of the explosion, which apparently was due to ignition of natural gas in the boiler room. The negro porter,

Fire ruins of the two-story brick Woolworth store adjoining the Liberty Building on the west. Fire entered the store after the explosion blew out the four-inch brick filler wall in the side of the Liberty Building and the twelve-inch brick wall of the Woolworth store. The opening in the wall of the Liberty Building is shown boarded up.

who was the only victim of the explosion, was on duty to care for the gas-fired heating boiler and hot water heater. At the time only the water heater was in use. It is reported that before his death the porter stated that he entered the basement to light the water heater and found a loose connection which he could not fix. Hearing a hissing noise, he ran out to call help and on the way out he turned off the light switch at the boiler room entrance, causing the explosion. Another version is that he actually did light the heater before hearing the hissing noise. He was found on the first floor at the top of the stair, but could give no information as to what happened after the explosion.

A later examination disclosed no loose connections around the water heater and both burner valves open about one-quarter turn. The triple switch was found with one toggle up and two down, which would normally indicate one switch as being on. It is said that the damper on the water heater was found fully open. If the water heater had been left burning the night before and down-draft had extinguished the flame, gas would have accumulated, and had the janitor lighted the water heater the explosion would have occurred immediately. It seems most likely that the light switch at the doorway was the igniting medium.

The gas company's commercial service gas main is located in an alley on the north, from which a two-inch line at sixty pounds pressure extends into the building through a tunnel under adjoining property. This tunnel is about three feet wide and five feet high, with concrete roof and walls, and communicates directly with the boiler room. The service line is of welded steel pipe and terminates at a standard regulator in the boiler room, with proper relief valve and vent. The gas passing through the regulator is reduced to about a six-ounce pressure in a four-inch header extending to the heating boiler. From this a two-inch tap supplies the water heater.

Investigation developed that the two-inch service line had pulled out from a bolted coupling at the north end of the tunnel adjoining the alley. This may have been the cause of leaking gas entering the building, or the rupture of the pipe may have resulted from the explosion. An unusual feature was the fact that both the tunnel and the boiler room were filled with mud to a considerable depth from no apparent source. Possibly a vacuum created by the explosion sucked earth from the tunnel floor and from under the tunnel walls, and piled it in the boiler room where it was converted into mud by water from the hose streams. This theory would also explain the ruptured gas line as being caused by the same force.

Upon removal of the mud it was found that the heating boiler was practically intact and that its burner valve was closed. The vent pipe on the water heater was gone, but otherwise the heater appeared little damaged. A test of the regulator indicated that the relief valve was functioning properly. Numerous minor leaks found in the piping would seem attributable to the effects of the explosion.

Extent of Loss.

The total loss from the explosion and resulting fire was estimated at $280,000. Damage to the Liberty Building was $74,000. Damage to the Woolworth store was $78,000, and to the Goldstein-Migel department store was $28,000. Other losses amounted to approximately $100,000. Fire losses amounting to $162,000 were insured. Only a comparatively small part of the explosion losses were insured.

Norge Plant Fire, Muskegon Heights, Mich.

Report by Western Factory Insurance Association.
(Member N.F.P.A.)

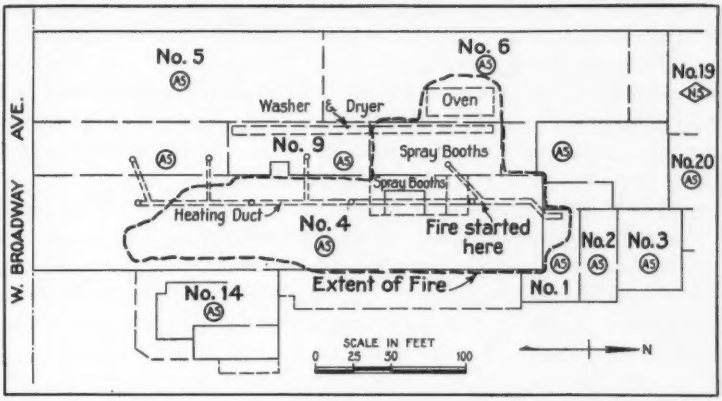
Fire in an unsprinklered underfloor space at the sprinklered plant of the Norge Corporation Division of the Borg Warner Corporation at Muskegon Heights, Mich., manufacturers of household electrical appliances, caused a loss which, including business interruption loss, amounted to approximately $300,000. The fire started on October 26, 1936, at a heating duct under Building No. 4. It spread under a large portion of the building and extended to adjacent buildings. Fire fighting operations early in the fire were hindered by dense smoke and the lack of gas masks and cellar pipes. This equipment was brought by airplane from Detroit and proved valuable at later stages of the fire.

Construction and Occupancy.

The plant is largely a metal worker but does some woodworking. Household appliances manufactured include electric refrigerators, washing machines, gas heated broiler ovens, air purifiers, and electric ironer machines. Building No. 4, in which the fire originated and which was most seriously damaged, is of three-story brick semi-mill construction. The first floor was occupied for woodworking, the second floor for assembling, and the third floor for assembling and testing refrigerator units.

There was an air space under the floor of the building. This air space contained a large heating duct from which branch ducts extended to the second floor of this building and to Building No. 9 adjoining. The floor above the air space was on three by twelve-inch joists, twelve inches on center, which were supported by nine by twelve-inch wooden girders. The girders were in turn supported by concrete and stone piers. The flooring of the first floor was two-inch tongue and groove boards with maple overlay. About five years before the fire the piers in the underfloor space were rebuilt and new concrete bases for columns were extended about four inches above the first floor. Two rows of these piers in the air space supported columns above the first floor. There was an average of one foot of space between the girders and the ground and two feet between the joists and the ground.

The heating duct in the air space extended from an indirect steam heated blower and fan in the adjoining Engine Room Building No. 1 to within fifty feet of the south end of Building No. 4. This duct had brick side walls, plank floor and two-inch tongue and groove boards on top. The top was flush with the bottom of the nine by twelve-inch floor girders. The duct narrowed down from three feet square to two feet wide and one foot high at the south end.



Four vertical metal pipes, three feet in diameter, extended from the ducts to the second floor. Four other ducts extended under adjoining Building No. 9, where they supplied heat to the first floor.

Building No. 9, which was partly damaged by fire, was of three-story semi-mill construction supported from steel framing with ordinary joists in the air space under the first floor. The portion of the first floor damaged by fire was occupied for metal washing and drying, and the spraying of washing machine tubs and minor refrigerator parts. A section of the first floor around the spray booths had a concrete overlay. Several holes about fifteen inches in diameter and several pipe holes in walls in air spaces between the buildings assisted the spread of fire.

All departments of both buildings were idle during the taking of inventory. The first floor was vacant and the upper floors were lightly stocked. During production periods all floors are heavily stocked, particularly the first.

Sprinkler protection consisted of a wet pipe automatic system with primary supply from a 150,000-gallon gravity tank, of which 50,000 gallons were available for domestic use. The secondary supplies were a 1500-gallon fire pump and city water. There were no sprinklers in the underfloor spaces. Standard supervised watchman service was maintained but was not a factor in the fire.

Story of the Fire.

A number of employees were working in the various departments in connection with inventory and repair work while the plant was shut down. An employee passing through the first floor of Building No. 4 saw smoke coming from the air space about forty feet from the north wall. He first notified the plant engineer, and when they returned to investigate, the fire had spread toward the north wall. The engineer returned to the engine room and tele-

phoned to the Muskegon Heights and Muskegon fire departments. Alarms were also sounded over a central station supervised box and a public fire alarm box to the Muskegon fire department.

Before the fire departments arrived the employees used hose lines from near-by standpipes and directed a stream through a small opening in the floor into what they thought to be the seat of the fire. As soon as this stream was used the fire appeared to spread over a larger area.

The 1500-gallon electric centrifugal fire pump taking suction from a 150,000-gallon reservoir was immediately put into service. This reservoir is normally filled by deep well pumps, but can be filled through a six-inch connection from a six-inch city main. The pump can also take direct suction from the city main. Other water supplies consist of a six-inch connection with a ten-inch city main and the 150,000-gallon gravity tank forming the primary supply to the sprinkler system. The water supplies were adequate during the fire, and the gravity tank remained full.

About six lines of hose were directed through openings in the east and south walls of Building No. 4 into the air space, but the masonry piers in the air space prevented the water from reaching the fire. Shortly thereafter the smoke became so dense that the men could not get into Building No. 4 more than twenty feet from the east wall. A small section of flooring was removed at that point in an effort to direct streams into the air space.

All this time the fire was spreading north and south. It also extended into the air space under Building No. 9 and then into the space under Building No. 6 through holes in the walls. Additional hose streams were laid until a total of twelve were in service. Streams were directed onto the first floor of Building No. 4 with the hope that some of the water would run through the floor.

By about 6 P.M. the reservoir was almost empty and pump suction was changed to the six-inch city water main. When it was found that sprinklers had started to operate, one and later two fire department pumpers were connected to the fire department sprinkler connection. Another pumper was used to fill the fire pump reservoir, and the deep well pumps normally supplying the reservoir were also put in service. About 10 P.M. the reservoir was half full.

Later the fire reached Engine Room Building No. 1, igniting the wooden housing around a large belt drive. This fire was extinguished by three sprinklers and one hose stream. About the same time fire also broke out in the center of the second floor of Building No. 4, which it entered through the heating duct. This was promptly extinguished by two sprinklers and two hose streams. In all a total of thirty-nine sprinklers operated and assisted in confining the fire principally to the unsprinklered underfloor spaces.

About 2:30 A.M. smoke masks and cellar nozzles were received from the Detroit fire department by airplane. Time was lost in getting the nozzles into

use because of the difference in couplings and threads, but later they were of considerable help in controlling the fire under the floors. Shortly after 2:30 A.M. the fire appeared under control and work was started to remove the first floors of Buildings Nos. 4 and 9 to extinguish the remaining fire. A large crew of employees was used in this work and the fire was extinguished by 10 A.M.

Cause and Loss.

The fire was presumably caused by spontaneous ignition in or on top of the heating duct in the air space.

Property damage consisted of replacing the entire floor of Building No. 4, and an area of about thirty-five by one hundred feet of the first floor of Building No. 9. A portion of the woodworking machinery on the first floor of Building No. 4 required replacement, and equipment in Building No. 9 required repairs. The main drive belt in the engine room was damaged by fire, and stocks in Buildings Nos. 4, 6 and 9 were damaged by smoke and water. The total property loss was estimated at a maximum of $100,000. A much larger loss was avoided because the stone and concrete piers in the air space under Building No. 4 had been extended above the first floor a few years before the fire. Had this not been done the fire might have caused the collapse of Building No. 4.

The use and occupancy loss was large, due to the curtailment of production of new models of refrigerators and washing machines, work on which was to start on November 2. The use and occupancy loss was estimated at a maximum of $200,000, making the total loss from this fire about $300,000.

Conclusions

The large loss in this fire was directly chargeable to violations of good fire protection practice as given in various N.F.P.A. regulations. The Regulations on Blower Systems provide that all ducts shall be constructed of non-combustible materials. The Sprinkler Regulations provide that all portions of a building should be protected, including inaccessible spaces where seemingly least needed. Every standard dealing with cut-offs between buildings or sections provides that walls must be complete, without openings through underfloor spaces. In the present case the undesirable features responsible for the loss might readily have been eliminated by the use of a concrete floor on a solid fill and some form of heating system not employing underfloor ducts.

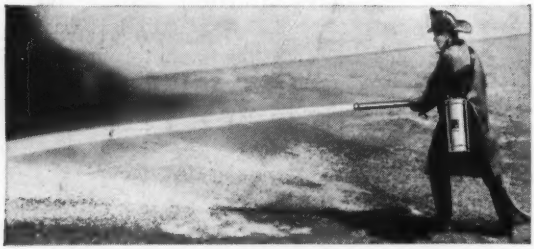
It should be noted, however, that prior to this fire it was believed that the ventilating ducts were of non-combustible construction and that there was nothing in the under floor space to cause fire. It would have been impossible, short of tearing up the floor, to determine the actual construction of the ducts.

Air Foam.

By A. O. Boniface, Secretary,
Chemical Fire Extinguisher Association. (Member N.F.P.A.)

Foam as an extinguishing agent for oil fires and the various other types of fire for which it is particularly suited is such an established feature of modern fire fighting that any new developments in this field are of particular interest. A new type of foam is now in use in which the foam is produced mechanically instead of chemically, and the bubbles contain air instead of carbon dioxide gas. Air foam has been used by European fire departments successfully for several years, but it is only during the past year that it has been introduced in the United States.

Air foam is produced mechanically in a special ejector nozzle. Water, passing through the nozzle under high pressure, draws in air and a special foam-making solution. The foam-making solution mixes with the water and a stream of foam bubbles is discharged. The stream is light colored in appearance, as distinguished from the brown color of chemical foam. The consistency of the air foam can be varied by controlling pressure and other conditions, just as in the case of the chemical foam. The method of use in fire fighting is identical for the two types of foam.



Air foam stream in operation. Note hip pack container for foam-producing solution.

The size of playpipe now used takes about twenty gallons of water per minute, with a minimum pressure of 75 lbs. per sq. in. required for effective operation, higher pressures giving a greater rate of foam discharge. The foam-producing solution is drawn in at a rate of a little less than one gallon per minute, and a foam stream of about 300 gallons per minute is discharged. One gallon of foam solution, weighing nine pounds, produces about 350 gallons of foam.

When the foam playpipe is in use, the foam solution is carried in a two-gallon hip pack container slung from the fireman's shoulder. Until the solu-

tion is exhausted, or for a little over two minutes, one man can operate the stream alone. For continuous operation, a second fireman must refill the hip pack as needed, which can be done without interrupting the discharge.

The relatively small rate of water consumption by this device permits its use on small hose or booster apparatus, as well as on 2½-in. hose. The range of the stream is about 40 ft.

This new type of equipment is intermediate in size between the 33-gallon wheeled foam extinguishers and the standard size of portable chemical foam generators, all of which have their proper places in fighting fires with foam.

Cable Piano Company Fire, Atlanta.

By H. N. Pye (Member N.F.P.A.),
South-Eastern Underwriters Association.

Three persons lost their lives, and a loss of approximately $250,000 resulted when a fire of unknown origin, starting in the elevator shaft, involved the five-story building occupied by the Cable Piano Company and the Atlanta Conservatory of Music in Atlanta, Ga., on November 19, 1936.

The fire had evidently been in progress for some time before it was discovered and the alarm transmitted. Overhead wire obstructions, parked automobiles and failure to control a large lunch-hour throng of spectators impeded fire department operations and rescue work. Unprotected floor openings were largely responsible for the rapid spread of the fire.

The building was a five-story, mezzanine and basement structure of brick, plank on timber construction with unprotected steel columns and girders. The building had approximately a fifty-foot frontage and was one hundred feet in depth. Unprotected floor openings, extending from the basement to the roof, were a passenger elevator shaft and a freight elevator and stair shaft. Another stairway was enclosed with wooden lath and plaster partitions. An outside metal fire escape extended into the rear alley. Exits appear to have been well marked. Except at the front of the building all windows were of wired glass in metal sash.

The Cable Piano Company used the basement and first three floors for the storage and display of pianos and other musical instruments, and had a small refinishing shop on the third floor. The entire fourth and front part of the fifth floor was occupied by the Atlanta Conservatory of Music and was divided into studios by partitions with wooden lath and plaster on both sides. The remainder of the fifth floor was used for storage, and there was a shooting gallery on the first floor. The city building code adopted in 1924 prohibits the occupancy of non-fireproof buildings over three stories in height for the purpose of public assembly.

Story of the Fire.

At the time of the fire there were several employees and customers in the part of the building occupied by the Cable Piano Company, and several music instructors and pupils in the studios of the Atlanta Conservatory of Music. The fire had evidently been in progress for a considerable time before being discovered. An employee of the piano company was apparently the first occupant to notice the fire, which appeared as burning grease or embers dropping down the freight elevator shaft. An alarm was telephoned to fire department headquarters, and the store manager went through the various floors giving the alarm. Outsiders also saw smoke and sent in an alarm from a street box. The janitor brought a blind piano tuner from the third floor to the basement on the freight elevator. Shortly afterward the elevator machinery fell into the basement, spreading the fire to all floors.

About the time the elevator machinery fell, most of the occupants of the building had become aware of the fire and made their exit by way of the front stairs. However, some of the occupants of the studios remained unaware of the rapidly spreading fire. All but three finally escaped by the fire escape, or by jumping to the roof of an adjoining building, or by fire department ladders. Three of the occupants were either unaware of the fire in time to escape or became confused and were unable to locate the exits. Two women and one man died from suffocation and their bodies were recovered by the fire department during the course of the fire.

Fire Department Operations.

The first telephone and box alarms were received simultaneously at 12:32 P.M. Four pumpers, one aerial ladder truck, one service ladder truck, one squad wagon, and one water tower responded to this alarm under an assistant chief. Upon arrival at 12:34 P.M. the assistant chief called for a second aerial ladder truck. The fire department would have had a better chance of saving the trapped victims had both ladder companies responding to the first alarm been equipped with aerial ladders. In 1933 the National Board of Fire Underwriters recommended that the ladder company which responded to the first alarm with a service ladder truck be equipped with an aerial truck. The rescue work was also apparently handicapped by lack of training of the firemen in the operations necessary to handle a fire of this magnitude. Life nets were not used, as the trapped persons were on the fifth floor, which was too high to permit use of this equipment.

At 12:38 P.M. a third aerial ladder truck, another service ladder truck and two additional pumpers were called. Three subsequent alarms from 12:42 to 1:24 P.M. brought nine additional pumpers. The fire was fought by hose lines from the street, by three lines taken up the stairway to the second and third floors, and by hose streams from adjoining buildings, and by two ladder

F. & L. Photo Service.

The Cable Piano Building fire in Atlanta, Ga., which took the lives of three persons on the top floor on November 19, 1936. This picture was taken at 12:39 P.M., shortly after the fire department arrived. Overhead wires, parked automobiles, and the lunch-hour crowd hindered fire department efforts to rescue occupants. One man may be seen standing on top of a first floor awning awaiting rescue.

pipes and one water tower. Special stream appliances used consisted of cellar pipes and distributing nozzles. Nine pumpers supplied about thirty hose lines. The water supply was adequate.

Fire department operations were impeded by large volumes of smoke. Repeated attempts to use gas masks were ineffective. Ventilation of the building was not attempted. Fire department operations were materially hindered by spectators, parked automobiles and overhead wires. Police in the vicinity

answered the first alarm, and after the second alarm all police in the mercantile district and nine patrol cars responded. Ropes taken from fire apparatus were used to establish fire lines, but the lunch hour throng of spectators was ineffectively controlled. Traffic lanes for ambulances and the fire department supply truck were not established, and this equipment experienced constant difficulty in getting to and from the fire lines.

The Volunteer State Life Insurance Company Building, an eight-story fire-resistive structure, adjoins the piano company building on one side and was equipped with a standpipe having 2½-inch hose connections at each story. Fire department hose was not connected to these 2½-in. connections, but five hose lines were carried from the street and were played on the fire from the fourth, fifth and sixth floors and from the top of the Volunteer Building. The 2-inch linen standpipe hose in the Volunteer Building was also used on all floors from the third to the seventh. One pumper was connected to the standpipe siamese connection.

Cause and Loss.

The cause of the fire is unknown, but the place of origin was undoubtedly in the pent house or near the top of the freight elevator shaft. The morning of the fire an elevator inspector visited the pent house for an inspection of the machinery. The inspector appears to have departed between 9:15 and 10 A.M. The falling of the freight elevator machinery shortly after the fire was discovered appears to give definite evidence as to the place of origin. Also the condition of the building and contents after the fire indicates that the fire spread from the corner of the building where the freight elevator shaft was located.

The building was badly damaged, but the roof and all floors remained after the fire. Floors immediately adjoining the freight elevator shaft were badly burned and in some places entirely destroyed. Damage by fire to the front portion of the building was confined mainly to upper portions of partitions and ceilings. Floors, rugs and chairs were practically undamaged. The south stairway was intact after the fire although doors and sections of the hand rail were burned. The loss was approximately $250,000. Most of this loss was due to the total destruction of the stock of pianos. Some of these were entirely destroyed, others were badly burned, and the remainder were damaged by smoke and water.

The fire did not spread beyond the building of origin, although the Volunteer State Life Insurance Company Building on one side and a mercantile building on the other side were damaged by smoke and water. Damage of between $10,000 and $15,000 was suffered by the Volunteer Building. The exposed wall of the Volunteer Building was somewhat damaged by fire.

Crowley, La., Butane Explosion.

Report by Louisiana Rating and Fire Protection Bureau.
(Member N.F.P.A.)

Butane gas escaping from a broken connection on a truck tank not complying with the N.F.P.A. recommended good practice regulations was responsible for an explosion and fire that killed five people in Crowley, La., on Oct. 22, 1936. The area where the explosion occurred is shown by the map on page 263.

The owners of the filling station at the corner of W. Sixth Street and N. Parkerson Avenue, C. E. Carnes & Co., Inc., were also engaged in the retail distribution of butane, for which purpose they employed a utility truck equipped with a 1000-gallon skid tank in a wooden cradle. The tank was made of three-sixteenth inch sheet steel electrically welded. It was ten feet long and four feet in diameter. There were four openings: the fill opening near the top 20 inches from the front end; a safety valve in the top; a two-inch discharge outlet equipped with the necessary ell, short connecting nipples, and hose coupling low in the rear end; and, near the top, a half-inch line used for collecting returning gas when filling underground tanks. When not in use the tank was transferred from the truck to the platform by a winch located in the body just back of the cab. The platform was about three inches higher than the floor of the truck, making it necessary to jack up the rear of the truck before moving the tank.

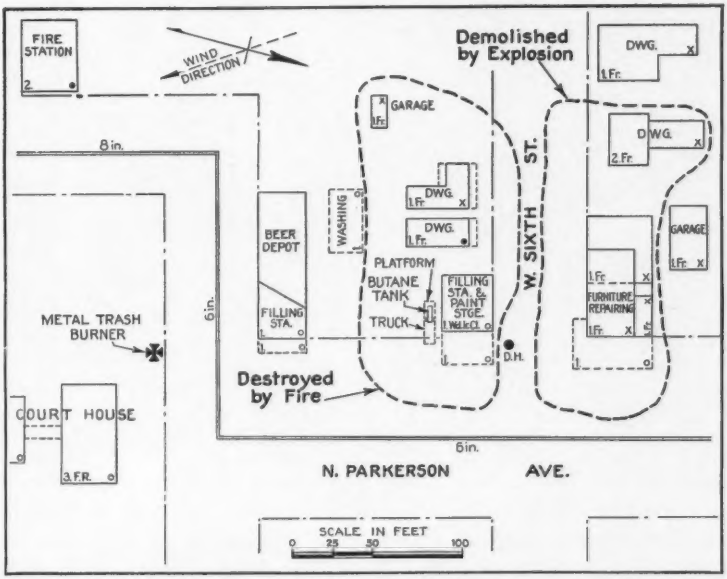
Story of the Fire.

The day before the fire the tank had been pulled from the patform to the truck and driven to Eunice, a town twenty miles away, for refilling. It returned loaded with 600 gallons of butane and was left overnight backed up to the platform. In the morning negro employees went about removing the tank to the platform. At the back of the platform they chained a piece of galvanized pipe in an upright position to be employed as a pulley. They looped a ½-in. steel cable from the truck winch around the pipe and attached the returning end to the cradle of the tank. They had pulled all but 18 inches on to the platform when the outlet caught on something. Not identifying the trouble, they continued to pull until they had broken the discharge connection. The butane flowed out of the 2-in. outlet, vaporizing immediately.

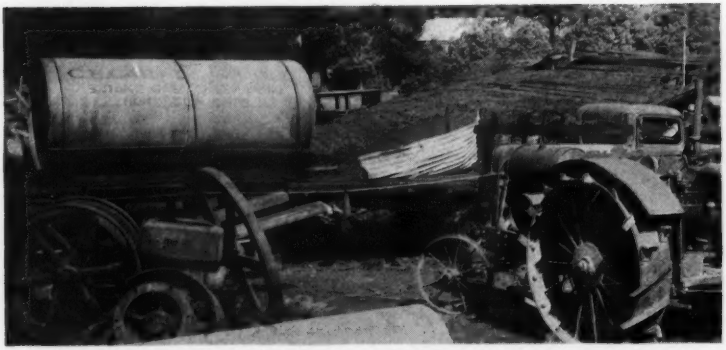
Realizing the hazard, the employees immediately called a Mr. Fogelman, operator of a filling station about 75 feet south of where they were. Either Mr. Fogelman or one of the negroes noticed a city police officer passing in a car, stopped him and asked that he call the fire department, which was located only about a half block away. The officer told them that he did not see any

Tarver Photo.

The Crowley, La., explosion and fire of Oct. 22, 1936. Butane, a liquefied petroleum gas, released by the breaking of a pipe connection from the tank shown, spread over streets and near-by buildings, taking fire from a trash burner 162 feet away. The burning jet of liquid gas from the tank is shown. This picture was taken just after two buildings had been demolished by explosions of the gas, three others set on fire, and five persons killed.

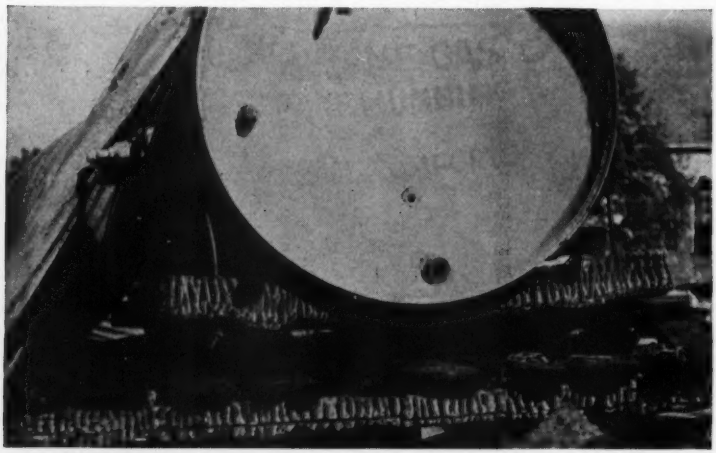


fire and the negroes said, "there ain't none yet, but there will be one pretty quick." Someone called the fire department and the police officer began warning passing school children to get away from the vicinity, and several people passing, living in near-by houses, began notifying people in the surrounding buildings of the danger and advised them to get out of the houses. The gas vaporized before reaching the ground and began to spread about the streets and surrounding buildings. A slight northwest wind carried the vapors to a metal trash burner, located on the court house square about 162 feet south of the gas tank, and the vapors ignited and flashed back to the tank and buildings. It was said that there were four distinct explosions, the last being the loudest, which could be heard for several miles, occurring in the one story frame mercantile building, located at 603 North Parkerson Avenue, across the street north of the garage building where the tank was located. All buildings had been vacated around the filling station, with the exception of the dwelling located 16 feet west of the warehouse, in which five people were trapped when the fire spread to the warehouse and filling station and to the two dwellings west. These people were seriously burned; four of them died the same afternoon or night. A negro man passing along the east side of Parkerson Avenue (115 feet wide) was burned from the flash and died that night. The fire department arrived immediately after the explosions and four hose streams were played on the filling station and two dwellings in the rear.



The butane tank after the fire, resting on the wooden platform. When it was pulled from the truck at the right of this picture the discharge connection caught and broke off.

Shortly after the explosion the fire departments from the towns of Rayne and Eunice arrived. The fire was brought under control in about twenty minutes and was confined to the three buildings, which were completely enveloped in flames immediately following explosions. These buildings were totally destroyed. The two-story dwelling at 114 West Sixth Street was practically demolished and the frame mercantile building at 603 North Parkerson Avenue was totally demolished by the explosion.



End of the tank, showing the hole near the bottom where the discharge valve and fittings broke off, allowing the butane to escape.

Ruins of the home where four persons were burned to death and another seriously injured.

Store building wrecked by the explosion, but not ignited.

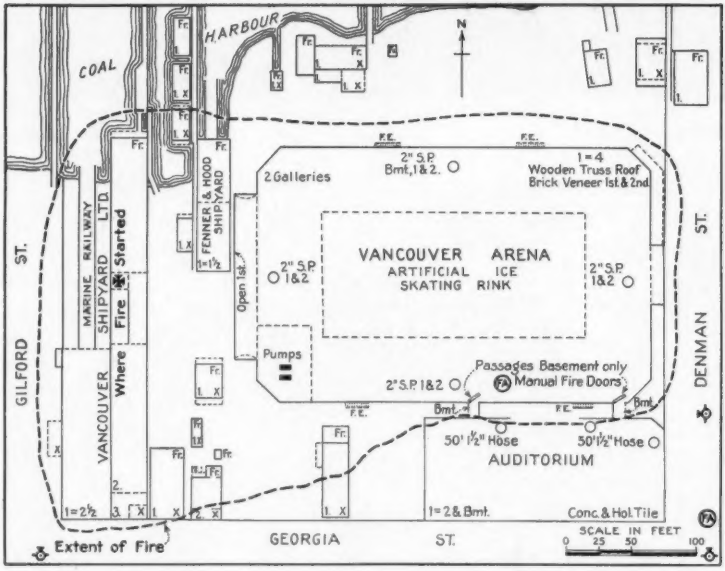
Conclusions.

This fire clearly demonstrates the hazardous nature of butane. Here it was handled in a tank constructed and used in a manner in direct violation of the N.F.P.A. good practice requirements for tank trucks for liquefied petroleum gases. Like other hazardous materials, butane can be used with reasonable safety if standard recommended safeguards are observed, and if all transportation, handling and service operations involving butane are in the hands of competent, responsible persons who understand the nature of the hazard.

Vancouver Waterfront Fire.

Report by British Columbia Insurance Underwriters' Association.
(Member N.F.P.A.)

A fire that burned unnoticed in the early morning of August 20th until it had reached uncontrollable proportions was responsible for one of the largest fire losses in Canada in 1936. Starting on the western end of a waterfront block and aided in its progress by a slight west wind, it swept rapidly from one frame structure to another. When it was finally checked it had destroyed most of a city block, with a loss of approximately $250,000.



A man living in a houseboat in one of the slips of Coal Harbor was the first to see the fire shortly after 1 A.M. At that time it was spreading rapidly through the first story of the Vancouver Shipyards, Ltd. The man saw no one else who might have turned in an alarm, so he hurried toward the fire along Gilford Street. He spent some time looking for a fire alarm box near the intersection of Georgia and Gilford Streets. Soon after this a policeman came along Georgia Street from the west and saw the fire. He immediately went back one block to Chilco Street and turned in the alarm at 1:36 A.M.

The burning of the Vancouver Arena, Aug. 26, 1936.

The response to the alarm was rapid but only included two stations which sent twenty-four men, who laid six lines of hose. By this time the fire had completely involved the Vancouver Shipyards and had spread to the adjoining, unoccupied Fenner and Hood Yards. The battalion chief telephoned almost immediately for the response from a third station. Two subsequent alarms brought virtually the entire fire fighting facilities of the city to the fire.

Firemen got their equipment working rapidly, but the fire had an impossible start in this large concentration of frame structures. It entered the Arena under the floor of a raised portion on the west side, and flared up in the wooden interior. Firemen had barely time to get a standpipe hose into operation within the building before the heat and smoke drove them out.

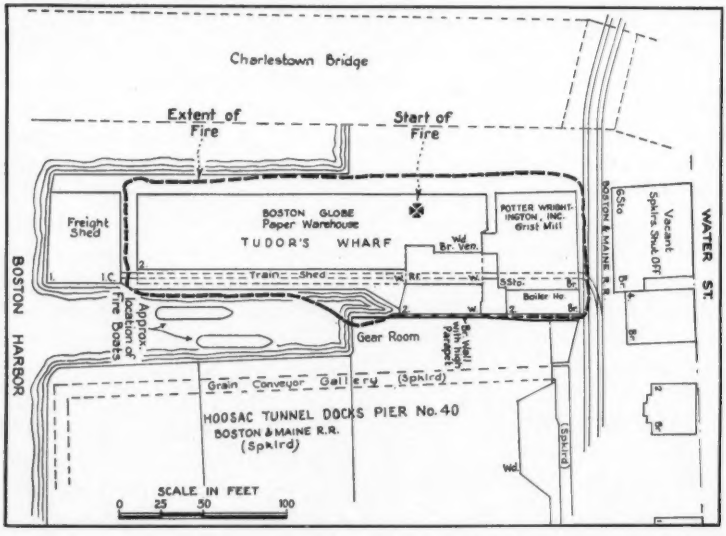
The whole block, with the exception of the fire-resistive Auditorium, was hopelessly involved. To the Auditorium, therefore, the firemen turned their attention. They were aided by the fire doors in the basement passageways, which had been shut by the proprietor. The composition roof made it possible to prevent the fire from entering through the top, although the air was filled with flying embers from the shingle roofs of the frame structures. These brands set fire to poles, disrupting electric and telephone service.

When the 200 men, using seventeen trucks and a fireboat, with a total of twenty-one hose streams, had finally extinguished the fire at 3:28 A.M., the Auditorium alone remained standing in the block. Two shipyards, the Arena, and several small buildings had been completely destroyed. The Auditorium was damaged on its roof and north wall. The computed loss, not including miscellaneous damage to boats, power lines, etc., and exclusive of losses due to interruption of business, was $217,019.

Charlestown Waterfront Fire, Boston.

Fire starting in a waterfront warehouse in the Charlestown section of Boston, Mass., on the night of November 27, 1936, spread to a near-by four-story brick grist mill, which was destroyed, and threatened a large area with destruction. The loss was about $375,000. The large loss was due to the headway of the fire when the fire department arrived, lack of exposure protection for the destroyed mill, and severe weather conditions.

The building in which the fire originated was a one- and two-story frame warehouse of four-inch brick veneer, occupied by the Globe Newspaper Publishing Co. for the storage of newsprint paper in rolls. The warehouse was located on Charles River Avenue and was known as Tudor Wharf. The warehouse had three- and four-inch plank floors. It was more than two hundred feet long and approximately fifty feet wide. Floor areas covered about 25,000 square feet. There were three four-inch brick curtain walls with unprotected openings, two cut-off elevator shafts and four stairways enclosed with single wooden sheathing and wooden doors. One of these stairways was about twenty feet from the point where the fire started. The warehouse was partly on the piles over the harbor and partly on solid fill.



Note: This report has been prepared from data obtained from reports by the Boston Board of Fire Underwriters, Eastern Underwriters Association, Boston Protective Department, Boston Automatic Fire Alarm Company, Boston & Maine Railroad (Members N.F.P.A.), observations by the N.F.P.A. staff, and other sources.

International.

Burning of the five-story grist mill on the Charlestown waterfront section of Boston on the night of November 27, 1936. Fire started in the brick-veneered warehouse, a small portion of which is shown at the right, and entered the mill through unprotected window openings. Dust explosions spread fire through the grist mill before hose streams could be carried up ladders shown at the front of the mill.

The adjacent grist mill, which was also completely destroyed, was a two- and five-story brick-joisted structure directly exposed through ordinary glass windows. There were numerous floor openings. The building was entirely occupied by Potter-Wrightington, Inc., a tenant since 1876, for the manufacture of cereal meals, crackers and dog biscuit.

At the rear of the burned buildings and partly separated by a slip were the docks and grain elevator of the Hoosac Tunnel Docks of the Boston and Maine Railroad. A brick wall with a high parapet served to cut off Hoosac Dock Pier No. 40 where it adjoined the warehouse and mill.

Story of the Fire.

Just previous to starting his 11 P.M. round, the watchman for the Boston Globe warehouse opened a door to a locker and washroom section of the office and discovered a serious fire in a wooden clothes and record storage locker. Realizing that the fire was beyond his control, the watchman at once telephoned the Globe Newspaper Company by a private line. Unfortunately he did not identify which of the two warehouses of the company located in Charlestown was involved, and the telephone operator had to call back for definite information. The watchman claims to have sounded an alarm which was received from a city box at 10:54 P.M., just as apparatus was responding

International.

Ruins of the waterfront warehouse more than two hundred feet long occupied by the Boston Globe Newspaper Publishing Company for the storage of newsprint paper in rolls. At the upper left may be seen the ruins of the five-story grist mill which was also destroyed. In the background may be seen the grain conveyor on the Hoosac Tunnel Docks Pier No. 40, which was severely exposed.

to the alarm telephoned from the newspaper office. One engine company, one ladder company and a fireboat under a district chief responded to the telephone alarm. A second alarm was sounded at 11 P.M. This was followed by a third alarm at 11:04 P.M., a fourth alarm at 11:06 and a fifth alarm at 11:13 P.M. These alarms brought a total of twenty-seven engine companies, five ladder companies, one water tower and two fireboats. The fireboats were of much value in preventing the spread of the fire to the seriously exposed Hoosac Tunnel Dock properties.

When the first fire company arrived the fire is said to have been coming through a skylight on the roof of the warehouse. The rapid spread of the fire is shown by the fact that an automatic fire alarm was received from the fourth floor of the adjoining mill at 10:56 P.M., only a minute or two after the first alarm. This alarm was sent by the automatic fire alarm company central station to the fire department, but was not transmitted by the fire department, as the city box had been previously transmitted. The Boston Protective Department (salvage patrol) also received this alarm from the central station and responded from their headquarters in the downtown section of Boston. When they arrived the heat was so great that they were unable to enter the fourth floor of the mill, but spread thirty-two covers on the lower floors. Following the Protective Department, a second alarm fire company carried a line of hose into the mill building in an effort to keep out the fire, and ladders were raised

International.

Firemen are shown directing a stream from a portable deluge set on the ruins of the newspaper warehouse. Numerous rolls of newsprint paper which passed through the fire may be seen in the débris. While some of these rolls were only burned on the outside, they were watersoaked and ruined for newspaper use.

against the front walls. In a short time, however, a smoke or dust explosion occurred on the upper floors, and both departments were forced to leave the building. Just after they left another explosion occurred and fire flashed out of the windows and downward almost to the sidewalk. Following this the building was quickly involved and was soon destroyed.

It is considered fortunate that the fire did not develop into a general conflagration, due to its headway and the cold and windy weather which prevailed at that time. Less than twenty-five feet distant to the north on Charles River Avenue and across a railroad right of way was a vacant six-story brick building in which sprinklers had been shut off. This building furnished an excellent point of vantage from which numerous streams were directed into the burning mill. In addition to the ten large monitor pipes on the fireboats, other heavy stream appliances used included a water tower, seven wagon guns and eight portable deluge guns. In all the fire department used approximately fifty fire streams. The fire was not completely extinguished in the ruins for several days.

Of special interest was the protection of the large frame metal-clad sheds on pile and timber substructure forming the Hoosac Tunnel Docks of the Boston and Maine Railroad, which were severely exposed. Shortly after the first alarm to the fire department a cargo watchman on Pier No. 40 sent in an alarm through a manual box on the automatic alarm system at 10:59 P.M. The fire department did not transmit this alarm, as the city box had already been sounded. Six terminal employees who were near by connected twenty-one

lengths of 1½-inch standpipe hose to put six streams in service to wet down the roofs of Piers Nos. 40 and 41, and also used the hose to good effect inside Pier No. 40, as a constant stream of embers was coming in through openings between doors.

A projecting corner of the pier shed used as a gear room beyond the end of the brick party wall ignited and the side walls were burned through, but the fire department stopped the fire from spreading farther. The contents of the gear room consisted chiefly of rope and tackle. This was covered by the Protective Department and was not damaged by fire or water. As nearly as can be determined, five sprinkler heads on the dry pipe system protecting Pier No. 40 and twelve thermostats operated properly when the fire entered the gear room. There appears to be some difference of opinion as to whether water was discharged from these heads. Several fire department officers expressed the opinion that the sprinklers were discharging water early in the fire, but other evidence indicates that the dry valve for that part of the system may not have tripped until about 9 A.M. the next morning. Subsequent investigation showed that any obstruction to the sprinkler system was entirely local and that the balance of the system was in operating condition.

Pier No. 40 contained about 2000 bales of cotton, 500 barrels of rosin, some baled waste paper and other freight which was promptly covered by the Protective Department, but some slight damage resulted from the large amount of water on the pier. A slight fire was noticed at 10 A.M. the next morning on the under side of a grain gallery running around Pier No. 40, but this fire was quickly extinguished by firemen.

Cause and Loss.

The cause of the fire is not known. The total loss was about $375,000, of which $150,000 was to the Globe Newspaper Publishing Company warehouse and contents. The loss to the mill was about $215,000. Loss to seven freight cars on the private sidings of the paper warehouse and mill was between $9000 to $10,000. Other small losses included damage to Pier No. 40 and its contents.

Gasoline Filling Station Fire Record.

With the rise of the automobile to the status of a social necessity there has been an enormous increase in the number of gasoline filling stations. In 1933, the latest year for which figures are available, there were 170,404 stations in the United States. They were owned by 156,451 proprietors who employed 171,812 men and women. Through the year, while 23,827,290 gasoline tanks were supplied from 15,436,234,000 gallons of gasoline, $1,531,724,000 in sales was recorded by the filling stations. This amount probably represents more than two-thirds of the total consumption. It may be estimated that all these figures will have increased 20% for the year 1936.

Estimates based on incomplete fire marshals' reports from typical states show that for the year 1935 there were 1700 gasoline filling station fires in the United States, with a loss of $374,000. (See October, 1936, QUARTERLY, p. 165.)

The fire record of gasoline filling stations has on the whole been relatively favorable in proportion to the large number of stations and the tremendous quantity of gasoline handled. This favorable record is due to several factors. Perhaps the most important of these is the fact that the gasoline is stored in underground tanks and the gasoline dispensing devices used are largely of safe types listed by Underwriters' Laboratories. State and local legislation based upon the recommendations in the N.F.P.A. Flammable Liquids Ordinance largely requires underground tank installation and the use of pumps of approved types. Another important factor is the general provision of fire extinguishers of types suitable for use on gasoline fires. Gasoline stations, particularly those owned and operated by the major oil companies, are well designed and are on the whole manned by an intelligent class of employee. However, persons constantly handling gasoline are apt to become somewhat indifferent to its hazard and to neglect precautions such as the prohibition of smoking. The fortunate fact that the temperature of smoldering tobacco is not high enough under ordinary conditions to ignite gasoline is probably an important factor in the record.

Recent tax legislation will apparently result in a definite tendency towards decentralizing the retail gasoline business, putting the control to a greater extent in the hands of small independent operators instead of being handled through stations owned and operated by large companies. The chain store tax in certain states places a prohibitive burden on a company owning and operating a large number of gasoline stations. The Social Security Act likewise places a tax upon the large operator which does not fall upon the independent operator who employs only one or two men or is assisted by mem-

bers of his own family. It remains to be seen what effect this change will have upon the fire record, although it appears likely that without centralized control gasoline stations may not be so well maintained, and increase in fire loss may result.

Causes of Fires in Filling Stations.

The following cause table has been compiled from 149 filling station fires reported to the N.F.P.A. Department of Fire Record. This is only a very small fraction of the total number of fires which occur in filling stations. Many fires are of minor importance and are not reported. Such fires are a daily, even an hourly occurrence throughout the country, but the first aid fire protection afforded stops them immediately and they are not heard of further. Therefore this table is to be considered only as a typical cross section of filling station fires. It includes fires in garages having a retail gasoline trade where the fire is directly connected with this phase of the business.

Table I.

Causes of Fires in Filling Stations.

I.	Filling automobile tanks		19
	Matches and smoking	5	
	Spark or short circuit	3	
	Gasoline on motor or exhaust	6	
	Motor left running	2	
	Firecracker thrown by boy	1	
	Filling vacuum tank, motor running	1	
	Unknown	1	
II.	Filling storage tank		28
	Matches or smoking	9	
	Static spark	5	
	Spark from electric equipment	2	
	Gasoline spilled on hot motor	2	
	Motor left running	2	
	Ignited from motorcycle	2	
	Firecracker thrown by boy	1	
	Truck backed into wall, broke faucet	1	
	Unknown	4	
III.	In building (exclusive of filling operations)		58
	Leaked or spilled gasoline ignited by:		
	Spark from electric apparatus	9	
	Furnace or heater	4	
	Matches and smoking	3	
	Gasoline motor	2	
	Gasoline used for cleaning floors and machinery ignited by:		
	Furnace or heater	2	
	Spark from apparatus	2	
	Static spark	1	
	Fumes from vent pipe ignited by:		
	Spark from motor	1	
	Stove	1	
	Lighted torch	1	
	Compressed air apparatus:		
	Tank exploded	1	
	Compressor overheated	1	
	Gasoline light plant exploded	2	

Gas or oil heater fires and explosions	10	
Explosion of fumes from cleaning compound by:		
Stove	1	
Ignition of rubber cement fumes by:		
Static spark	1	
Spontaneous ignition in oily rags	2	
Unknown in can of gasoline	1	
Defective motor	2	
Heating oil on stove, overflowed	1	
Unknown	10	
IV. Outside in filling station yard (exclusive of filling operations)		44
Leaked or spilled gasoline ignited by:		
Match or smoking	5	
Unknown cause	3	
Pumps, fired by:		
Collision	12	
Short circuit	6	
Broken by excess pressure, ignited by globe light	1	
Unknown	1	
Gasoline on clothes ignited by:		
Smoking or match	1	
Spark	1	
Unknown	1	
Storage tank ignited by:		
Collision	1	
Unknown	1	
Spilled alcohol ignited by:		
Match	1	
Static spark	1	
Heater fire	1	
Unknown cause	2	
Kerosene drums, cause unknown	1	
Storage tank being cleaned:		
Static spark	1	
Fumes from tank car:		
Unknown cause	1	
Gas being drained from car:		
Spark from air pump	1	
Unknown	2	
Total		149

To show the relation of the principal causes of these fires, the table has been condensed into the following 11 classifications:

Table 2.

General Causes of Filling Station Fires.

	No. Fires	Per Cent
Electric short circuit or spark	26	17.5
Matches and smoking	24	16.1
Oil burners, gas heaters, stoves, etc.	20	13.4
Motor or exhaust of vehicle	15	10.1
Collision of motor vehicle with equipment	14	9.4
Static spark	9	6.0
In mechanical equipment (gasoline motors, air compressors, etc.)	8	5.4
Firecrackers	2	1.3
Spontaneous ignition	2	1.3
Lighted torch at vent pipe	1	.7
Unknown cause of ignition	28	18.8
	149	100.0

It can be seen from these tables that the majority of fires in gasoline occur when the gasoline is being misused. As long as the liquid is in its proper place and used according to established safe practice there is little trouble, but when it is carried about in pails, or spilled on the station floor or in the yard, or liberated through a collision, it becomes dangerous.

The loss record for these 149 filling station fires is less representative than the above tables because of the non-representative class of fires reported. An average drawn from the loss table would heavily exaggerate the loss per fire for filling stations as a whole. It is included merely to further describe the fires from which the above tables were compiled.

Table 3.
Loss Record of Filling Station Fires.

Loss	No. Fires	Per Cent
Small, or under $100	86	57.7
Moderate, or $100, but under $1000	19	12.7
Considerable, or $1000, but under $10,000	23	15.5
Large, or $10,000, but under $100,000	20	13.4
Over $100,000	1	.7
	149	100.0

The large loss fires are nearly always started by ignition of gasoline during the filling of storage tanks from tank trucks. Most of them involve a garage attached to the filling station, or adjoining buildings. The values within a gasoline filling station alone are not sufficient, even in the event of complete demolition, to reach the large loss group.

A summary of the loss experience of thirty-eight large oil companies, compiled by D. V. Stroop of the American Petroleum Institute for four years, ending in 1933, and published in the QUARTERLY in April 1935, includes 17,527 filling stations, or roughly ten per cent of the total. The average value of these stations was $5345, and the average annual loss per $100 of property value was $0.049, not including loss of gasoline or oil, costs due to personal injury of employees, damage to other than oil company property, nor losses due to interruption of operations.

The exposure hazard to property adjoining filling stations is serious, when tank trucks are involved. In these cases, large quantities of gasoline are often spilled on the street, resulting in immediate and wide spread of the fire. Explosions of tank trucks or above ground storage tanks may throw the fire considerable distances through the air.

The N.F.P.A. Department of Fire Record has received reports of filling station fires from five states where this occupancy is separately classified. These figures represent only stations with the leading occupancy of retail gasoline distributing. It is therefore expected that the loss should be low. Most of the fires are undoubtedly in spilled gasoline during the filling of automobiles and unloading of tank trucks, and many of them are not reported.

Structural damage is usually small, as the buildings are generally of moderate value and non-combustible construction, largely cement blocks. Even with these contributing factors, the fire loss of $61,309 for five states seems small.

Illinois	$11,503
Iowa	10,421
Kansas	3,485
Ohio	20,519
Wisconsin	15,381
Total	$61,309

Loss of Life.

An aspect of the fire record of gasoline filling stations that is not so favorable is the loss of life involved. Fires involving gasoline are nearly always flash fires if not explosions. They give bystanders little chance to escape. Of the 149 fires reported to the N.F.P.A. Department of Fire Record, 25 resulted in the loss of 48 lives. Below is the tabulation of these fires with their causes:

Loss of Life Fires and Causes in Filling Stations.

		Fires	Lives
I.	Tank truck filling storage tank:		
	Motor running	2	12
	Truck backed into wall	1	2
	Unknown	1	8
II.	Filling gas tank of automobile:		
	Boy threw firecracker	1	1
	Backfire	1	1
III.	Miscellaneous in station office:		
	Oil burner explosion	1	1
	Gasoline stove tank explosion	1	1
	Explosion of compressed air tank	1	3
	Cleaning floor with gasoline, ignited by stove	2	2
	Escaped fumes ignited by:		
	Broken light bulb	1	1
	Coal heater	2	3
	Unknown	1	1
	Carrying gas from burning station	1	1
	Heating oil on stove	1	2
	Gasoline on clothes ignited by electricity	1	1
IV.	Miscellaneous in station yard:		
	Collision with pumps	2	3
	Exploding drum of alcohol	2	2
	Gasoline on clothes ignited by:		
	Electric spark	1	1
	Cigarette	1	1
	Tank being cleaned, ignited by spark	1	1
Total		25	48

Typical Filling Station Fires.

The more serious fires at filling stations are, to a large degree, started in connection with the filling of underground storage tanks from tank trucks. A few fires which show the large amount of gasoline that may become involved, the possibility of explosion, and the consequent damage and large loss of life are described below:

Wreckage of the tank truck involved in the Downey, Calif., filling station explosion in which nine people were killed and forty-one injured.

DOWNEY, CALIF., APRIL 21, 1922. The operator of a tank truck was filling the underground tank at a filling station from the rear compartment of his trailer. When he lifted the hose to check the level of the tank, static electricity ignited the gasoline. The operator dropped the hose and ran. The fire spread to the trailer and thence to the truck. The truck exploded, causing the death of eight people. People who were standing within 50 feet of the truck were enveloped in flames. Others who were from 150 to 200 feet away were blistered, and people 200 feet or more away were thrown to the ground. The tanks were blown a distance of from 50 to 250 feet. The explosion is attributed to the fact that the tanks were full when the fire started, and the vents were not large enough to release the pressure generated by the heat of the fire. (H-18530.)

RALEIGH, N. C., JULY 31, 1922. An employee threw a burning match with which he had lighted a cigarette under a three-ton truck which was discharging gasoline into the storage tanks of a filling station. An instant after the match struck the pavement the truck was ablaze. The hose burned through, allowing gasoline to flow across the yard. This spread the fire to a touring car standing at the curb. Flames burned two telephone cables and the poles on either side of the fire fell into the street. The fire was not brought under control until the flow of gasoline was shut off. The truck driver was badly burned. (H-18759.)

PITTSBURGH, PA., AUGUST 29, 1924. The storage tank of a garage with interior pumps was being filled from a gasoline tank truck. The truck was parked with its motor running, just inside the door. The truck had carried a load of high test gasoline for some miles on a hot day, and when the driver took off one of the tank caps, the gasoline vapor was released, and formed an explosive mixture with the air. The mixture was ignited by the motor, and eleven people were killed in the resulting explosion. (S-38672.)

CHICAGO, ILL., SEPTEMBER 29, 1927. Fire started during the filling of an underground gasoline tank. The cause was possibly static electricity; the ground chain was not in contact with the ground. Spilled gasoline was ignited and exploded, the fire following. The faucet of the tank wagon was left open and the flowing gasoline added a continual supply of fuel. The loss to buildings and contents was heavy. (H-25039.)

FALL RIVER, MASS., AUGUST 8, 1934. During the filling of a tank some gasoline was spilled. A boy threw a lighted match into this gasoline, starting the fire. The driver could not turn off the flow of gasoline from the truck, so he got in and drove away, filling the street with burning gasoline. He stopped in front of an electric substation. Here the fire was extinguished by the public fire department. Considerable damage was done to the substation. (H-39542.)

MONTREAL, P. Q., AUGUST 27, 1934. A tank truck was parked in front of a garage, filling the underground storage tank. Drippings from the hose, and then the hose itself, caught fire. The fire spread along the hose until it reached the truck. The tank exploded, doing considerable damage to the garage and near-by automobiles. (H-39062.)

Filling Automobile Tanks.

Probably a great many of the small, unreported fires in filling stations occur in the refueling of automobiles. The few that are reported to the N.F.P.A. are noteworthy mainly because of injuries or loss of life. The majority of the following are examples of carelessness.

TURNERS FALLS, MASS., JULY 3, 1926. A boy threw a firecracker from an automobile taking on gasoline, and the car and gasoline pump beside it burst into flames. The boy's clothing caught fire and he died from his burns. (H-23565.)

BOSTON, MASS., OCTOBER 25, 1927. A man drove up to a filling station to have the gasoline tank on his truck filled. He left the motor running and had opened the top of the gasoline tank when an explosion occurred. The man was badly burned. The loss was about $50. (H-25083.)

NEW BEDFORD, MASS., JULY 12, 1929. Gasoline was spilled on the hot motor while a truck was having its tank filled. The driver was badly burned. Foam extinguishers used by the fire department extinguished the fire. The loss was considerable. (H-28568.)

A gasoline service station fire in Hamilton, Ontario, in July, 1932.

ABERDEEN, S. DAK., NOVEMBER 8, 1933. An automatic gasoline pump failed to shut off after the tank of an automobile had been filled. The spilled gasoline was ignited by what was said to be a short circuit. Clothes of the attendant ignited and he was seriously burned. (H-37315.)

Collision with Pumps.

An interesting and frequent cause of fires in gasoline filling stations is the collision of automobiles with pumps. The following cases are typical:

ATLANTIC CITY, N. J., AUGUST 18, 1925. An automobile stood in front of a gasoline station when the brake let go and the car slid down a small incline and struck a gasoline pump. The pump fell over, breaking the lighted electric bulb. A spark set fire to some spilled gasoline and the automobile was ignited. Near by was a tank truck filled with gasoline. The fabric hose attached to the truck caught fire. Fire on the hose and near the broken gasoline pump was extinguished by firemen. The automobile was destroyed. (H-22383.)

PHILADELPHIA, PA., OCTOBER 5, 1926. A customer was backing from a filling station, after having had gasoline put into the tank of his car. The reverse gear of his car jammed and the car backed into one of the tanks, resulting in a terrific explosion. (H-23826.)

SAN JOSE, CALIF., JULY 15, 1927. Three men were burned to death and three men were severely injured in a gasoline explosion when an automobile in which they were riding crashed head-on into a gasoline service station. (H-24819.)

SWAMPSCOTT, MASS., AUGUST 29, 1934. A man backing across a filling station yard knocked down a pump, which became ignited from the resulting short circuit of the lighting wires. First aid foam equipment readily extinguished the fire. (H-39730.)

Many fires in filling station buildings start from common causes not associated with the gasoline business. This fire started from a stove. Two lives were lost and the building was completely destroyed. The gasoline pumps in front of the building were not affected.

SEATTLE, WASHINGTON, SEPTEMBER 19, 1934. An automobile crashed into a filling station at high speed, knocking down three pumps and flooding the yard with gasoline. The ensuing fire burned one woman to death, and injured several others. (H-38728.)

Furnace or Heater Explosions.

Frequent fires occur within the station building itself from various causes. The most frequent of these, as evidenced by the N.F.P.A. records, is the explosion of heaters or stoves.

WAKEFIELD, MASS., JANUARY 6, 1926. A homemade oil burner was being tested in a filling station when it exploded and burned three men. One man died from his burns. The fire practically destroyed the station, with a loss estimated at $2000. (H-22921.)

PROVIDENCE, R. I., MARCH 20, 1934. The back fire of an oil burner shot flame up through a register, burning three men and doing considerable damage to stock. (H-38013.)

NEW ORLEANS, LA., DECEMBER, 1934. A gasoline air heater, operated like a blow torch on the hand pump and pressure tank method, was responsible for this fire. The stem in the main needle valve that controls the gasoline supply became loose and allowed gasoline to escape. It was ignited from the burners. The damage was slight. (H-39459.)

POCOMOKE CITY, MD., JANUARY 7, 1935. An old gasoline stove tank exploded when too much pressure was pumped into it, killing one man and injuring another. (H-39042.)

Miscellaneous Typical Fires.

The fire hazards of gasoline distributing are so many and so varied that it is difficult to classify them further. The following are merely a few of the serious fires picked out at random to illustrate this fact:

NORTHAMPTON, MASS., OCTOBER 16, 1929. A 20,000 gallon gasoline tank had been removed from the ground for repairs. The tank was empty but contained fumes, which were ignited by a spark. The explosion threw the tank into the air, killed one employee and injured three others. (H-28506.)

MAPLEWOOD, N. J., MAY 21, 1930. Seven persons were burned when unsatisfactory gasoline which was being drained from an automobile tank ignited. It is believed that a spark from an automatic air pump at the filling station was the source of the ignition. Four men working in the pit under the car, two occupants of the automobile and a man who ran to their assistance received burns. (H-30527.)

HARTFORD, CONN., JUNE 4, 1930. Two-inch underground gasoline pipe lines from three 15,000-gallon buried tanks delivered gasoline under ten pounds pressure to filling pumps at this station, passing through filled-in ground close to the basement wall. Settling of the ground caused a leak in the pipe and gasoline filtered into the basement, in which was located a small motor-driven air compressor. The motor produced a spark which ignited the gasoline vapors, causing an explosion. The windows were broken and fixtures of the building were damaged. The loss was $583. (H-30200.)

HARTFORD, CONN., AUGUST 19, 1930. Gasoline fumes accumulated in the basement of a filling station due to a leak in an underground pipe from buried tanks to filling pumps. An explosion occurred when an employee broke an electric light bulb while sweeping the basement floor. He was killed and another employee who was upstairs was severely injured. Foam and soda-acid extinguishers were used to extinguish the fire. The loss was $250. (H-30201.)

BROCKTON, MASS., JANUARY 24, 1931. Employees were cleaning the floor of the office with gasoline to remove grease. Fumes from the gasoline were ignited by a coal stove in the room. One boy was burned to death and three others sustained severe burns. (H-30817.)

BRIGHTON, ONT., DECEMBER 31, 1933. A pail of oil was placed on a stove to thin it out. The oil boiled over, and the resulting explosion killed two and injured two others. (H-37967.)

SAN FRANCISCO, CALIF., MARCH 8, 1934. A man leaned against a pump, tripping the gasoline release. The gasoline flowed from the hose above him and covered him. His lighted cigarette ignited the vapor. The flames killed him. (H-38404.)

BIRMINGHAM, ALA., SEPTEMBER 28, 1934. A match was dropped in some drippings near an alcohol tank at a filling station. In the resulting explosion one man was killed and three injured. (H-39036.)

Gasoline leaking from underground tanks or piping accumulated in the basement of this filling station building in Elkhart, Indiana, where it was ignited by a furnace.

ST. PAUL, MINN., NOVEMBER 5, 1934. Several automobiles had had their radiators filled with alcohol from a drum in a filling station building. The drum was equipped with a faucet, and it is possible there had been some leakage. Employees were cleaning the floors of the station when there was an explosion, not violent enough to blow out any windows, but accompanied by much flame. Employees had time to escape before the whole building became involved. (H-38722.)

WASHINGTON, D. C., SEPTEMBER 6, 1936. A man was filling the vacuum tank of a car with gasoline from a can. A back fire ignited the gasoline, and set fire to the man's greasy overalls. He was seriously burned. (H-41435.)

FLINT, MICHIGAN, SEPTEMBER 28, 1936. An inspector testing gasoline pumps filled a measure and then asked an attendant where the fill pipe was in order to pour the gasoline back into the tank. The attendant pointed to the three separate pipes serving the three tanks. Near these there was another pipe of the same size, identical in appearance. This pipe had been installed to run a water and air line from the basement to the pumps, but had never been used. The inspector poured fifteen gallons of gasoline down this pipe. The gasoline flowed into the basement, giving off fumes that were ignited by a fire under a small heater. The explosion lifted the building up and dropped it into the basement, killing two and injuring six persons. (H-41436.)

Fires in Which There Was Loss of Life.

Last Quarter, 1936.

Since the publication of the October QUARTERLY, the N.F.P.A. Department of Fire Record has received from various sources 295 reports of fires in which there was loss of life. A total of 483 lives were lost in the fires included in this tabulation.

Six of the fires tabulated resulted in the loss of more than five lives each.

SEPTEMBER 26, 1936, BANDON, OREGON. Five men, five women, and one child lost their lives in a conflagration that was started by a forest fire. (See report on page 229). (H-41138.)

NOVEMBER 7, 1935, TIMMINS, ONTARIO. A father and five of his six children were burned to death as a result of his speeding a fire with kerosene. The fire trapped the children as it spread rapidly through the house. The father was fatally burned trying to save them. (L-3792.)

NOVEMBER 24, 1936, NEW ORLEANS, LA. Fire broke out in the hold of a ship which was being insulated for refrigeration. Nine men were trapped in the hold by the rapid spread of fire, which was fed by cork, shellac, and asphalt used for the insulation. (H-41288.)

NOVEMBER 30, 1936, DELTA, PA. Dynamite being carried into a slate mine by four workmen exploded from an unexplained cause and killed a total of seven men. (H-41286.)

DECEMBER 5, 1936, ST. AMBROISE, QUEBEC. A member of a rural family of eleven investigated a spilled can of gasoline with a match. An explosion occurred which rapidly spread fire through the house. The mother and seven of the children were trapped and burned to death. (L-3769.)

DECEMBER 8, 1936, MCGREGOR, IOWA. The mother of a rural family of nine used kerosene to start a fire in their one-room dwelling. She was so successful that the fire jumped the boundaries of the stove near the only exit, and trapped nearly the whole family. One girl only escaped from the house. She has left one brother, who was at work at the time. (L-3774.)

Several outstanding loss of life fires outside the United States and Canada have been reported for this quarter. These are not included in the tables but are reported here as a matter of interest.

AMSTERDAM, HOLLAND, OCT. 31, 1936. The oil bunker of a steamer exploded while the vessel lay at her berth. Seventeen of the seamen were killed and fifteen injured.

NEAR TABARZ, GERMANY, NOV. 1, 1936. An airliner carrying 13 passengers crashed and caught fire. Three were extricated from the wreckage by a witness of the crash. The remaining ten burned to death.

ST. CHAMAS, FRANCE, NOV. 16, 1936. A powder factory exploded from an unknown cause while the plant was in operation. Fifty-two workmen were killed and 100 injured.

CROYDON, ENGLAND, DEC. 9, 1936. An airliner carrying 17 passengers crashed and caught fire directly after taking off in a heavy fog. Only three of the passengers were able to escape from the flaming wreckage.

CONTRERAS, MEXICO, DEC. 10, 1936. The custom of burning candles throughout the night at the feet of images in a small fireworks factory resulted in an explosion. One of the candles fell to the floor and ignited the powder. Four men and two women were killed.

CALCUTTA, INDIA, DEC. 18, 1936. An explosion in a shaft of a coal mine trapped and killed 208 men.

Loss of Life Fires, October-December, 1936.*

This is a typical rather than a complete record, presented to show the conditions under which loss of life occurs, that they may be known and guarded against. The total loss of life by fire in the United States is estimated at 10,000 annually.

Class of Fire	No. Fires	Men	Women	Children	No Data	Total
Airplanes	7	17	2	0	0	19
Apartments, hotels, etc	46	38	22	8	0	68
Automobiles, buses, trucks	9	10	3	1	0	14
Automobile tank trucks	8	10	0	0	0	10
Barns and stables	2	1	0	1	0	2
Conflagrations	1	5	5	1	0	11
Dwellings—Rural	67	23	29	71	3	126
Dwellings—Urban	64	22	32	35	0	89
Forest or brush fires	10	15	2	2	0	19
Garages	2	2	0	0	0	2
Gasoline filling stations	5	6	0	0	4	10
Gas works	1	1	0	0	0	1
Institutions	5	5	0	1	0	6
Manufacturing occupancies	11	15	0	0	0	15
Mercantile occupancies	6	9	3	0	0	12
Mining property	4	13	0	0	0	13
Motion picture theatre	2	2	0	0	0	2
Oil refineries and bulk distributors	3	3	0	0	0	3
Oil well	1	1	0	0	0	1
Other known buildings	6	9	0	0	0	9
Out of doors	17	5	1	13	0	19
Railroad rolling stock	1	1	0	0	0	1
Response to alarms	2	3	0	0	0	3
Schools, colleges, etc	2	3	0	0	0	3
Ships and boats (house boats)	6	16	1	0	0	17
Tank vessels	1	1	0	0	0	1
No data	6	1	1	5	0	7
Totals	295	237	101	138	7	483

*This table is made up from those reports received by the Department of Fire Record between September 18, 1936, and December 18, 1936. A few of the fires included herein occurred prior to September 18, but were not reported until subsequent to that date.

Causes of Loss of Life, October-December, 1936.

Fatalities classified according to the immediate cause of the loss of life rather than according to the cause of the fire.

Cause	Men	Women	Children	No Data	Total
Airplane fires	17	2	0	0	19
Automobile and truck fires	10	2	0	0	12
Tank truck fires	9	0	0	0	9
Boat and ship fires (including house boats)	15	1	0	0	16
Chemicals and explosives	1	0	1	0	2
Children alone in house	0	0	18	0	18
Children playing with matches	0	0	14	0	14
Clothing ignited:					
Bonfire	2	0	5	0	7
Electricity	4	0	0	0	4
Fireplace	0	1	1	0	2
Furnace, stove or heater	1	7	1	0	9
Smoking (see also smoking in bed)	2	2	0	0	4
Miscellaneous	2	0	3	0	5
Conflagrations	5	5	1	0	11
Entering or re-entering burning building	9	4	0	0	13
Escaping fires, jumped	4	3	0	0	7
Explosions (miscellaneous):					
Butane	1	0	0	4	5
City gas	9	7	1	0	17
Pulverized fuel	3	0	0	0	3
Sulphur dust explosion	2	0	0	0	2
Unknown	2	1	0	0	3
Fire fighting:					
Firemen	13	0	0	0	13
Private	1	3	0	0	4
Flammable liquids and vapors:					
Alcohol explosion	1	0	0	0	1
Ammonia explosion	1	0	0	0	1
"Empty tanks," welding	1	0	0	0	1
Gasoline lighting plant explosion	1	0	0	0	1
Gasoline miscellaneous explosions	3	2	9	0	14
Gasoline tankers and barges	1	0	0	0	1
Gasoline spilled in basement	2	0	0	0	2
Heating kerosene on stove	0	1	0	0	1
Home dry cleaning	1	6	1	0	8
Kerosene explosion	1	1	0	0	2
Oil burner explosions	0	2	0	0	2
Oil refinery	4	0	0	0	4
Oil stove or lamp	5	9	5	0	19
Oil well fire	1	0	0	0	1
Other cleaning with gasoline	3	0	0	0	3
Starting fires with gasoline	2	3	0	0	5
Starting fires with kerosene	3	5	11	0	19
Tempering with oil	1	0	0	0	1
Forest fires (including fire fighting)	15	2	2	0	19
Home motion picture film	0	0	3	0	3
Mine fires and explosions	13	0	0	0	13
Overcome by smoke, suffocation	8	5	3	0	16
Oxygen tent fire—hospital	1	0	0	0	1
Railroad fires	1	0	0	0	1
Response to alarms	3	0	0	0	3
Smoking in bed	6	2	0	0	8
Traffic accidents at fires	0	0	1	0	1
Trapped in burning building	44	24	56	3	127
Trapped in incendiary fires	1	0	0	0	1
No data	2	1	2	0	5
Totals	237	101	138	7	483

Typical Loss of Life Fires.

Airplane Fire.

SEPTEMBER 29, 1936, NAPERVILLE, ILL. An airplane, pacing a streamlined train at an altitude of 100 feet for the purpose of making motion pictures, lost too much speed and nosed into a field. The plane immediately broke into flames which fatally burned the pilot and two men and one woman who were passengers. (L-3773.)

Automobile Fires.

SEPTEMBER 25, 1936, HUNTINGTON, WEST VIRGINIA. A coupe and a heavy truck collided and burst into flames. The driver of the truck, and a man and woman passenger in the coupe were burned to death, trapped in the wreckage. (L-3770.)

OCTOBER 15, 1936, FORT EDWARD, N. Y. After hitting another car, a truck crashed into a tree. The two men in the truck were burned to death in the ensuing fire. (L-3771.)

NOVEMBER 11, 1936, EAST ST. LOUIS, ILL. A coal truck crashed into the rear of another truck in a heavy fog. The coal truck caught fire, fatally burning three negroes trapped in the cab. (L-3772.)

Children and Matches.

SEPTEMBER 7, 1936, CRETE, NEBRASKA. A boy and his sister were playing in a shed. The sister had gasoline on her clothes. The boy had a pocket full of matches As he was crawling over a table in the shed, the matches ignited. He pulled them out of his pocket and threw them, accidentally hitting his sister. Her clothing ignited, and she was fatally burned running to the house. (L-3790.)

NOVEMBER 4, 1936, BROWNFIELD, TEXAS. A child touched a match to a bed quilt in the tent home of his family. The resultant fire killed him and a brother and sister. (L-3791.)

Escaping Fire, Jumped.

OCTOBER 2, 1936, EASTON, PA. Trapped in a burning dwelling, the maid jumped from a second story window, killing herself in the impact. (L-3789.)

NOVEMBER 22, 1936, WASHINGTON, D. C. A kerosene stove explosion trapped a woman in her second story apartment. She jumped from the window, landing on her head on the sidewalk. A fractured neck caused her death. (L-3788.)

NOVEMBER 22, 1936, BOSTON, MASS. Trapped in his apartment by a fire which started in a hat cleaning shop on a lower floor, a man jumped four stories on to the pavement. He was killed by his fall. (L-3787.)

Handling Gasoline by Lantern Light.

OCTOBER 5, 1936, LINCOLN, NEBRASKA. A woman carrying a lantern went to the porch of her rural dwelling to draw gasoline from a large tank

suspended overhead. While taking the container down she dropped it, and its contents, ignited by the lantern, exploded over her. (L-3786.)

OCTOBER 14, 1936, NORFOLK, NEBRASKA. A man working on a paving job was siphoning gasoline from a concrete mixer into a small tank by the light of a lantern. The lantern ignited the fumes and the explosion covered him with burning gasoline. (L-3785.)

Home Dry Cleaning.

OCTOBER 4, 1936, WATROUS, SASKATCHEWAN. A woman was cleaning clothes with gasoline in a rural dwelling when the gasoline vapors exploded. The spreading fire trapped her daughter, who also died of burns. (L-3784.)

Home Movie Film Fire.

JULY 8, 1936, HATTIESBURG, MISS. An amateur motion picture performance was being given for twenty children in a dwelling. The film that ran through the machine was coiled on the floor. Someone dropped a lighted cigarette into the mass while many children were gathered about the machine, and in the flash fire that resulted three of them were fatally burned. (L-3783.)

City Gas Explosion.

OCTOBER 5, 1936, OAKLAND, CALIFORNIA. A man put some coffee on the gas stove to boil and then took a nap. The coffee shortly boiled over and extinguished the gas. When the man awakened later and lit a match he was killed in an explosion. (L-3782.)

OCTOBER 29, 1936, ARKANSAS CITY, KANSAS. A gas light left burning during the night was extinguished. A woman awakened, smelled the gas, and struck a match. She was fatally burned in the explosion. (L-3781.)

Kerosene Heater and Stove Explosions.

OCTOBER 2, 1936, OMAHA, NEBRASKA. The fire in a kerosene stove went out. The fumes asphyxiated a woman and child. When the man tried to relight the fire with a match he and the remaining woman were killed in the explosion. (L-3780.)

NOVEMBER 1, 1936, MARTINEZ, CALIFORNIA. A woman who tipped over a kerosene heater in her kitchen was trapped and burned to death by the fire. (L-3779.)

Electric Short Circuit.

OCTOBER 17, 1936, MADERA, CALIFORNIA. The fuse in the radio circuit in a dwelling blew, and was promptly replaced by a penny. Fire that trapped and killed three children broke out at the short circuit. (L-3777.)

Oxygen Tent Fire.

NOVEMBER 26, 1936, NEW YORK, N. Y. An oxygen tent in which an old man was being treated in a hospital caught fire from a spark or short circuit in the electric motor controlling the oxygen supply. The man was helpless as the fire spread. He was kept alive two hours after attendants extinguished the blaze. (H-41290.)

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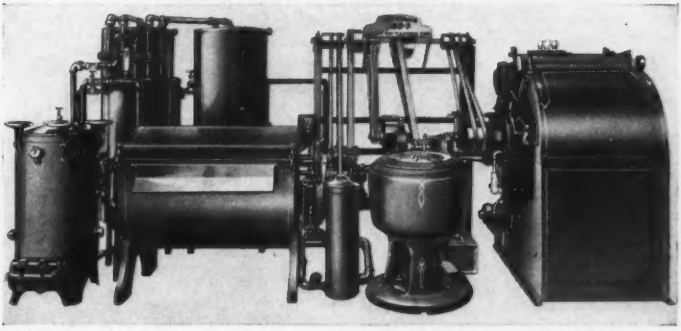

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COST OF PRODUCED GAS

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SEND FOR DESCRIPTIVE LITERATURE

UNITED STATES FIRE PROTECTION CORPORATION

1201 HUDSON STREET

HOBOKEN, N. J.

The EVIDENCE *of* Leadership
IN THE ENGINEERING OF
BETTER *and* SAFER LIGHT *for* HAZARDOUS LOCATIONS
BENJAMIN
TRADE MARK

Class I, Group D Atmospheres containing gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, and natural gas.	Dry cleaning plants, petroleum refineries, bulk oil stations, gasoline filling stations, gas plants, spray painting establishments, dip tank painting processes, chemical plants, artificial silk factories, pyroxylin plastic factories, fabric and paper coating plants, the rubber industry, the leather and shoe industry, soap factories, etc.	
Class II, Group G Atmospheres containing grain dust.	Flour mills, feed mills, grain elevators, starch plants, sugar cocoa and coal pulverizing plants and establishments or industries involving similar hazardous processes or conditions.	
Class III Locations in which easily ignitible fibres or materials producing combustible flyings are handled, manufactured or used and which are hazardous through such fibres or flyings collecting on or being ignited by arcing contacts, resistors, lamps or similar apparatus.	Cotton and other textile mills, combustible fibre manufacturing plants, cotton gins, clothing manufacturing plants, cotton-seed mills, wood-working plants, and establishments or industries involving similar hazardous processes or conditions.	
Class IV Locations in which easily ignitible combustible fibres are stored or handled and which are hazardous through such fibres being ignited by arcing contacts, resistors, lamps, or similar apparatus.	This class may include locations such as warehouses in which are stored or handled combustible fibres such as cotton (including cotton linters and cotton waste), sisal or henequin, ixtle, jute, hemp, tow, cocoa fibre, oakum, baled waste, kapok, Spanish moss, excelsior, and other similarly readily ignitible fibres.	

Complete descriptions and illustrations of the items listed above as well as of other Benjamin lighting products for hazardous locations are contained in Bulletin on Explosion Proof and Dust Tight Equipment. A postcard will bring you a complimentary copy by return mail.

BENJAMIN ELECTRIC MFG. COMPANY
Des Plaines, Illinois
New York Chicago San Francisco

THE "AUTOMATIC" SPRINKLER CORPORATION of America has made many outstanding contributions for the improvement of methods for fire protection and prevention in the past. Our Engineers have developed the SUPROTEX SPRINKLER SYSTEM which affords the SUPERIOR type of fire protection. Property is guarded continually by our vigilant Heat Actuated Device (H.A.D.).

I. Fire is immediately announced by the Suprotex system. Sensitive Heat Actuated Devices and the "Automatic" release react to rapid rate-of-rise of temperature caused even by a small fire, simultaneously giving an alarm and filling the sprinkler system with water. This alarm, sounded many minutes before the sprinkler heads fuse, affords opportunity for manual extinction.

II. The Suprotex Sprinkler System is constantly supervised —

(a) The "Automatic" Respirator maintains an air pressure of less than two pounds in the sprinkler piping, yet this slight pressure guarantees complete protection at all times.

(b) The "Automatic" Trouble Alarm detects pipe breakage or leakage without causing loss by water damage. This in itself is a distinct advantage over both wet and dry pipe systems.

(c) Whenever an attempt is made to close the main control gate valve the trouble siren sounds.

The REMARKABLE SIMPLICITY of SUPROTEX and the revolutionary improvement it represents enable "Automatic" to anticipate the more rigid requirements of tomorrow.

•

"AUTOMATIC" SPRINKLER CORP. OF AMERICA

YOUNGSTOWN, OHIO

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA
RATE OF RISE
TRADE MARK

SAFE CLINICAL PHOTOGRAPHY

...comes as a matter of course with the use of Eastman Safety Films. They are rated by underwriters as involving even less hazard than so much newsprint paper. Eastman Kodak Company, Rochester, N. Y.

EASTMAN

SAFETY FILMS

15 SECONDS After Fire Starts
FIRE DOORS CLOSE Automatically

1. *Fire Starts.*

2. *Dualguard Automatically Releases Fire Door.*

3. *Fire Door Closes and Cuts Off Fire.*

ROCKWOOD DUALGUARD Demonstrates Remarkable Speed in Tests

Tests conducted recently in our fire control laboratory clearly establish the greater speed and efficiency of our new DUALGUARD Fire Door Control over that of the common *fixed* temperature fusible link.

Views 1, 2 and 3 show in progressive steps our DUALGUARD Control automatically closing a fire door within 15 seconds after a test fire was started in six pounds of excelsior. Fire had only traveled to a point six feet from the door when the DUALGUARD Control closed the door and stopped the fire from entering the next room.

4. *Scene Before Fire. Note Dualguard Apparatus.*

This remarkable speed is possible because the DUALGUARD Fire Door Control operates on the *rate of temperature rise.* Starting at any existing temperature, it will operate in just a few seconds after fire breaks out and will close the door before a very rapidly spreading fire can pass through the opening. In contrast, the *fixed* temperature fusible link must wait until heat rises to a predetermined point high enough to melt the link.

DUALGUARD is the solution to your fire door control problems. Write for our descriptive folder Q31.

ROCKWOOD SPRINKLER CO.

WORCESTER, MASS.

Specialists in Fire Protection Engineering

In Canada:

Worcester Fire Extinguisher Co., Ltd., Montreal.

On Guard

Fire Alarm Boxes — Sentinels of the Fire Department—are continuously On Guard. In nearly 2000 municipalities—in many instances for more than 60 years—these Sentinels have been protecting the factories, commercial establishments, institutions, and homes near which they are stationed.

Irrespective of the hour or weather conditions, the Sentinel is always On Guard—always ready—to instantly sound the alarm and direct the fire-fighting forces to the scene of fire.

Some of the salient features of the VITAGUARD Fire Alarm System are:

LOW INITIAL COST	EFFICIENCY	NOMINAL MAINTENANCE COST
COMPACTNESS	SIMPLICITY	RUGGED CONSTRUCTION

Write for our new 40-page descriptive catalog.

THE GAMEWELL COMPANY

NEWTON, MASSACHUSETTS

In the *Vanguard*

of Every Advancement in

AUTOMATIC SPRINKLER PROTECTION

VIKING ACHIEVEMENTS

Viking Sprinkler Heads
For vertical or pendent installation.
Special heads for all purposes.

Viking Automatic Dry Pipe Systems
Tyden Dry Valve—3, 4, 6 and 8-inch sizes, the lightest and smallest Differential Valves on the market.
Tyden Accelerator — Impossible to water log diaphragm and orifice.

Viking Automatic Wet Pipe Systems
Tyden Alarm Valve—2½, 4, 6 and 8-inch sizes. Metal Seat Valves. All working parts easily replaceable.
Tyden Water Motor Alarm—Self-aligning roller bearings.
Tyden Retarding Chamber—No moving parts.

Viking Pre-Action and Deluge Systems
Tyden Control Valves—2, 3, 4 and 6-inch sizes. Self-setting, noiseless tripping.

Tyden Thermostatic Release—Self-setting, all connections made with standard pipe and fittings.

Look at the 15-year record of the automatic sprinkler industry and there you will find the name VIKING and that of its founder, Col. E. Tyden, indelibly identified with every progressive step.

Look over the list of VIKING achievements in the field of automatic sprinkler protection and take note that every one of these devices embodies many patented features of design and principle found in no other devices.

Today, as always, Viking offers for every type of risk in industry automatic sprinkler protection that is unsurpassed in efficiency, the last word in modern design and construction; and sold on the Viking Finance Plan, which makes it unnecessary for anyone to delay the installation of this needed equipment. Write for booklets containing complete information.

VIKING

AUTOMATIC SPRINKLER SYSTEMS

CALL ON VIKING

Whenever you have need of the services of a fire prevention engineer. There is no obligation for surveys and cost analyses.

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Atlanta, Ga.-Charlotte, N. C.—Crawford & Slaten Co.
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Cincinnati-Cleveland, Ohio—Viking Sprinkler Co.
Dallas-Houston, Texas—Texas Automatic Sprinkler Co.
Detroit, Mich.—Viking Sprinkler Co.
Grand Rapids, Mich.—Viking Automatic Sprinkler Co.
Huntington, W. Va.—C. W. Hutchinson, Inc.
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Kansas City-St. Louis, Mo.—Walton-Viking Co.
Los Angeles-San Francisco, Cal.—Viking Automatic Sprinkler Co.
Minneapolis, Minn.—Viking Automatic Sprinkler Co.
New York, N. Y.—Viking Automatic Sprinklers, Inc.
Philadelphia, Pa.—Viking Sprinkler Co. of Pa.
Seattle, Wash.-Portland, Ore.—Viking Automatic Sprinkler Co.
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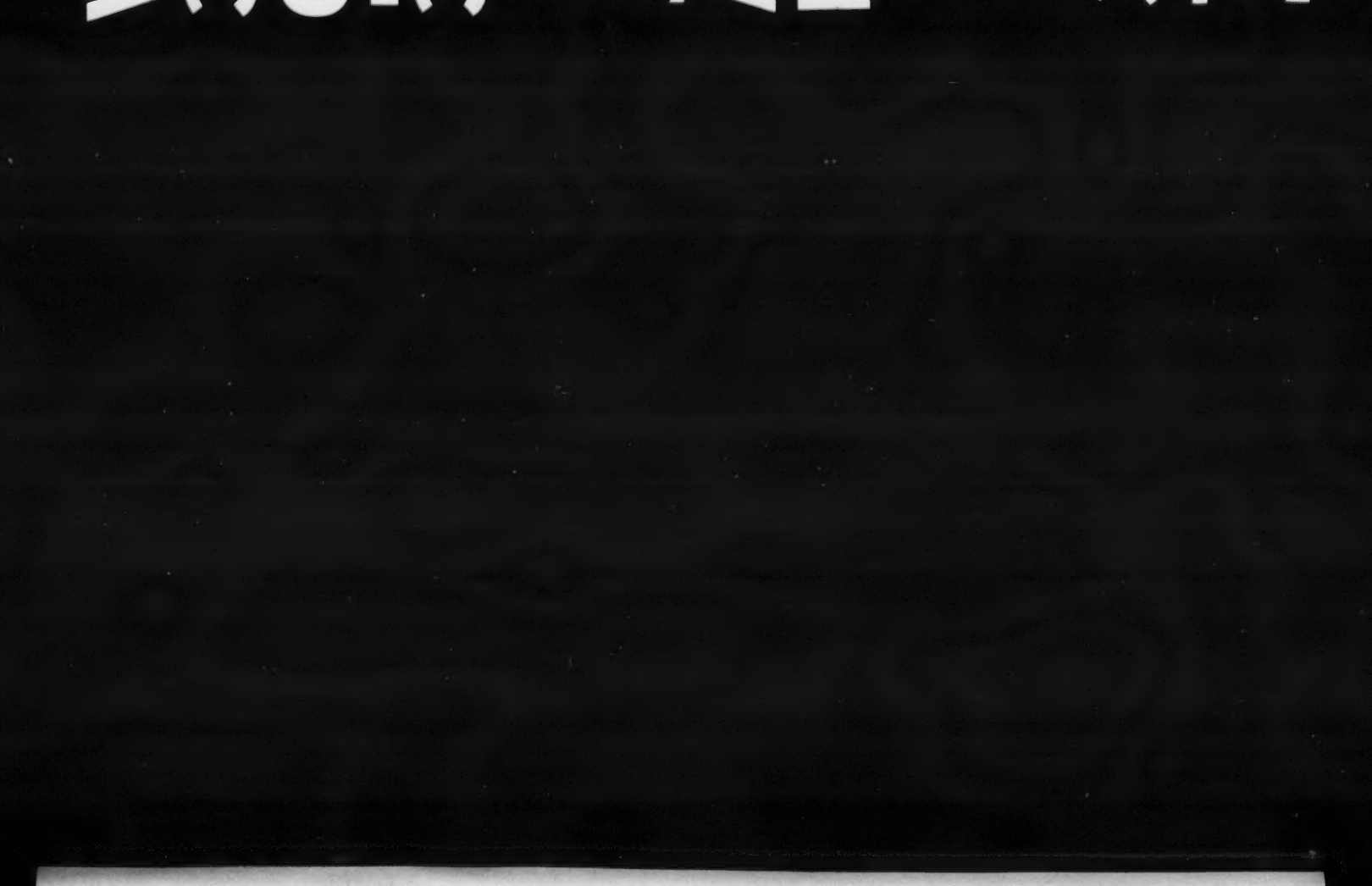
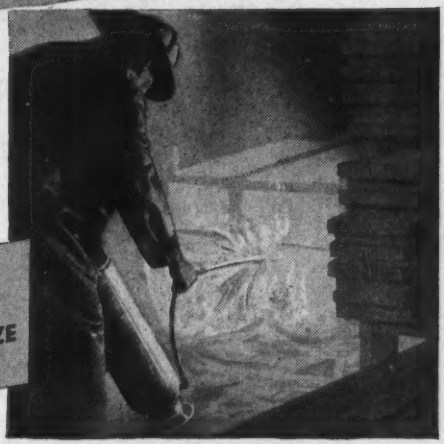
THE VIKING CORPORATION
HASTINGS, MICHIGAN



AERO ALARM SAVES VALUABLE STOCK



MILLWORK

ONLY FIVE FEET FROM BLAZE
ESCAPES UNDAMAGED

At 1:50 a. m. on October 21, the A.D.T. Central Station in Buffalo received an alarm from the Aero Automatic Fire Alarm System at a large lumber plant.* The fire department was immediately dispatched, and found the fire in a paint shop on the second floor. So speedy was Aero's action that only a chemical hand extinguisher was needed to extinguish the blaze.

A stock of finished millwork valued at several thousand dollars, stored less than five feet away, would unquestionably have been destroyed had there been as much as a minute's delay in detecting and reporting this blaze. As it was, the millwork was *untouched by the flames,* and total damages were placed at less than thirty-five dollars.

By automatically detecting and reporting fire in its incipiency, the A. D. T. Aero Automatic Fire Alarm System summons the fire department to the scene in time to keep damages to the minimum. The effectiveness of Aero is proved by its performance record—less than three cents loss per hundred dollars of insurable values is the average during the past ten years in Aero protected properties.

**Name and complete details available upon request.*

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A.D.T. SYSTEM

A NATION-WIDE PROTECTION SERVICE
AGAINST FIRE, BURGLARY AND HOLDUP

A.D.T.

NATION-WIDE

Automatic Fire Protection

When a choice of Automatic Fire Protection is made, no factor is more important than service rendered. That is why Grinnell backs nation-wide selling with nation-wide service, maintaining offices in thirty-four strategically located cities. Thus owners are assured of close supervision of installations and prompt attention to routine or emergency demands.

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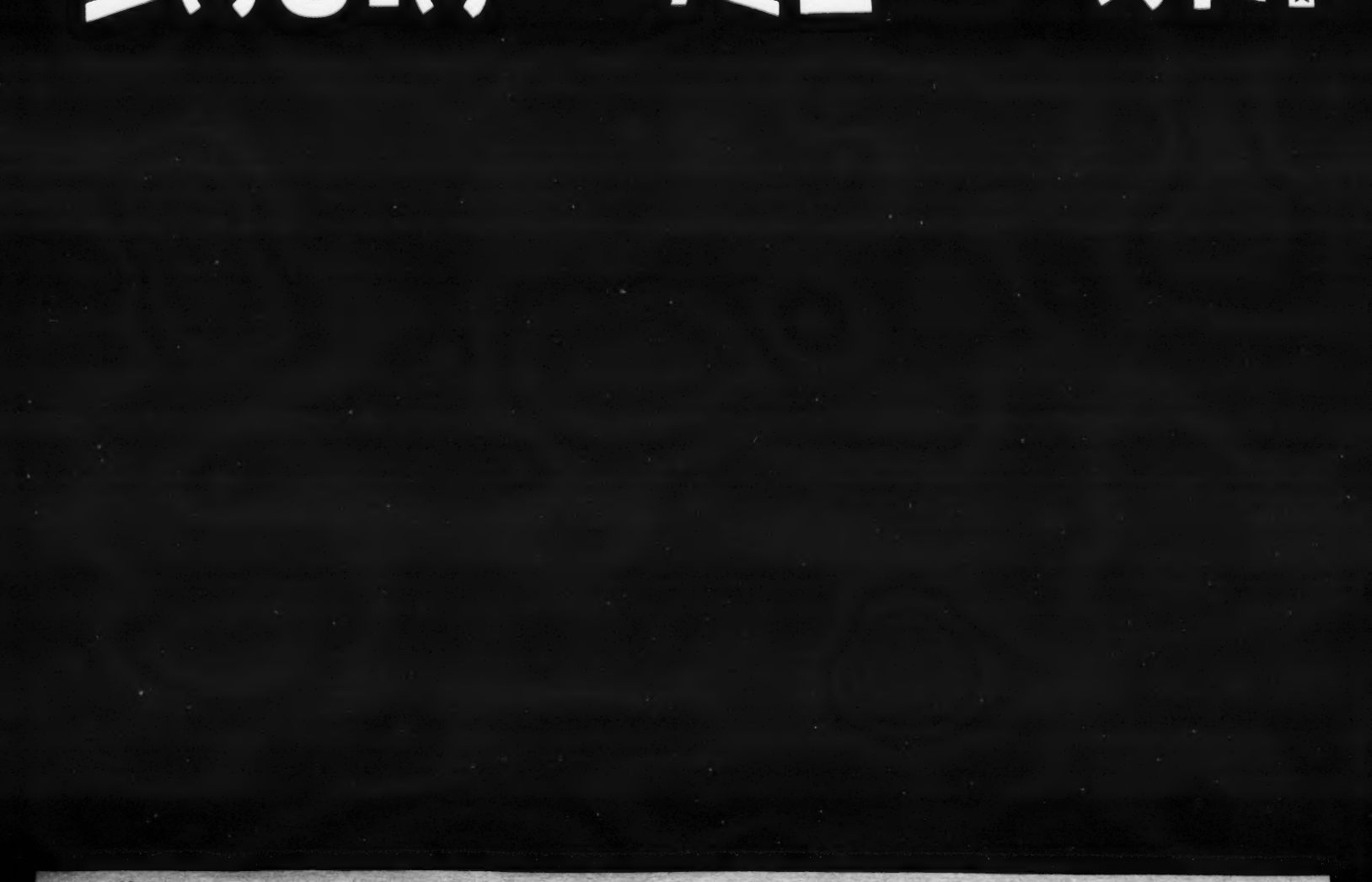
DIVERSIFICATION
QUALITY OF PRODUCTS
INSTALLATION
RESPONSIBILITY
ACCESSIBILITY

This ready accessibility is another proof that Grinnell Fire Protection is as complete as this eighty-year-old organization can make it. It is one of the Seven Standards of Superiority which have placed Grinnell equipment on guard over fifty billion dollars worth of the world's property. Our nearest office is always ready to give expert advice on automatic sprinkler requirements.

GRINNELL *Automatic Sprinkler*

FIRE PROTECTION

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